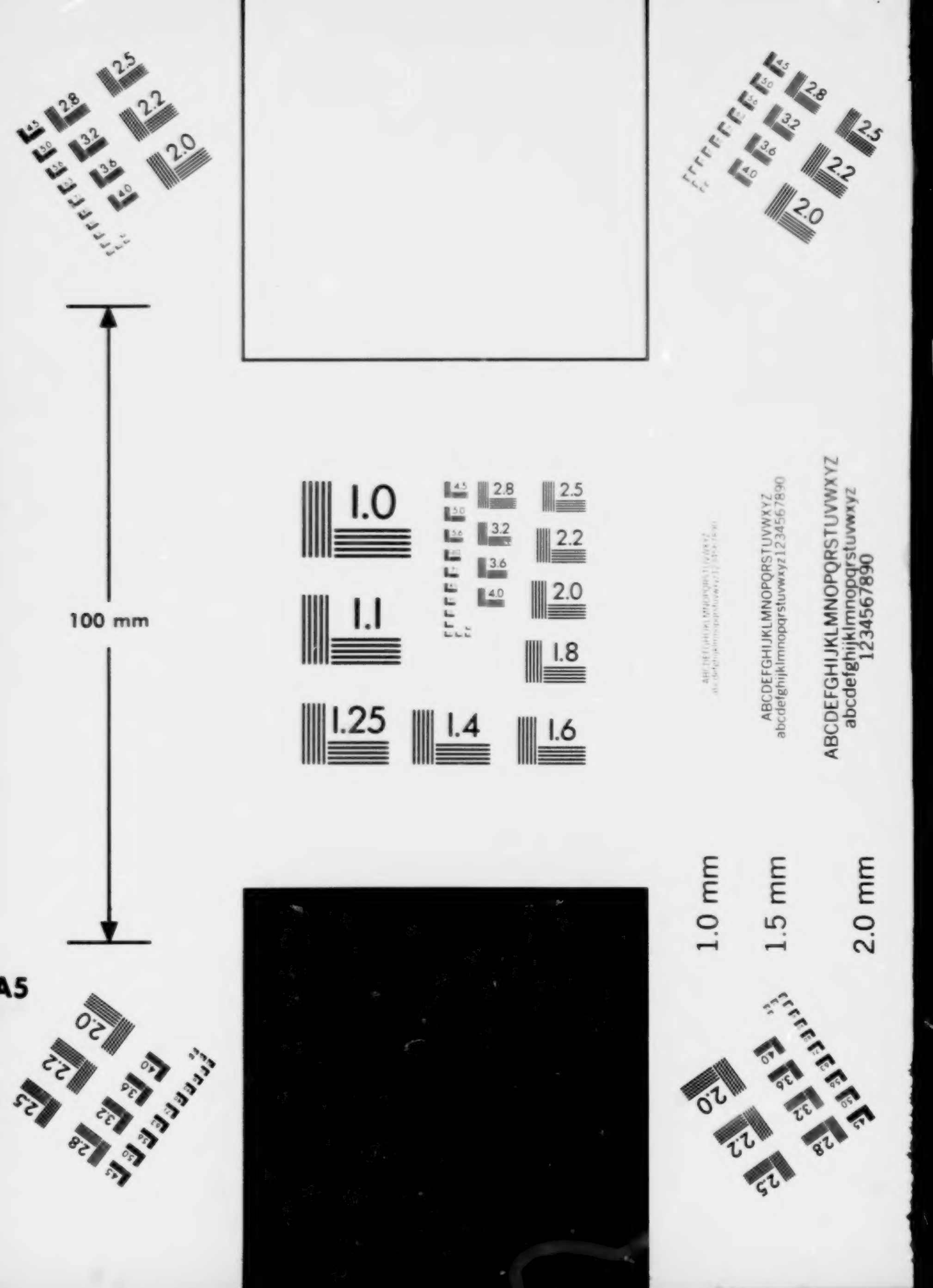
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ABSTRACT

After the passage of the North Carolina Elementary and Secondary School Reform Act of 1984, curriculum revision began. This handbook provides a detailed and integrated basic course of study for the revised curriculum in mathematics for grades K-12. The philosophy and rationale for the entire curriculum are first discussed, followed by sections on thinking skills and on programs for exceptional children. How to use the handbook is described. Mathematics is then considered including course of study and learning outcomes. The bulk of the document expands on the goals for each grade level, with objectives and suggested measures listed by mathematical skill. Numeration, whole numbers, fractions, measurement, geometry, probability and statistics are outlined for kindergarten. Decimals are added in grade 2; ratio, proportion, and percent and integers are added in grade 7; and real numbers and algebra are added in grade 8. For the secondary school, both non-college preparatory courses (General Mathematics, Consumer Mathematics, Technical Mathematics, and Introductory Algebra Parts I and II) and college preparatory courses (Algebra I, Geometry, Algebra II, Advanced Mathematics and Calculus) are outlined. Appendices present background information and requirements. (MNS)

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# TEACHER HANDBOOK

## MATHEMATICS K-12

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**North Carolina
Competency-Based
Curriculum
SUBJECT-BY-SUBJECT**

NORTH CAROLINA DEPARTMENT OF PUBLIC INSTRUCTION

# TEACHER HANDBOOK

# MATHEMATICS

## GRADES K-12

North Carolina Competency-Based Curriculum

Division of Mathematics
Instructional Services
North Carolina Department of Public Instruction

Raleigh, North Carolina
1985

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# Foreword

As a result of the Elementary and Secondary School Reform Act of 1984 and the appropriation which accompanied this act, the North Carolina State Department of Public Instruction engaged in an extensive audit and revision of curriculum throughout the summer and fall of 1984. The products of this work, the North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum, provide a detailed, integrated basic course of study for all subjects at all grade levels.

The North Carolina General Assembly has also made a commitment to the development of a basic education program. This program includes the staffing and material support needed for the full implementation of the North Carolina Standard Course of Study and the competency-based curriculum in all public schools throughout the State. The financial support of the General Assembly and the work of educators throughout the State in developing the competency-based curriculum are important contributions to our continuing efforts to provide a quality education for every child residing in North Carolina.

A. Craig Phillips
State Superintendent of Public Instruction

# Acknowledgements

The Instructional Services Area of the Department of Public Instruction acknowledges with gratitude the outstanding cooperation and assistance we have received from individuals and groups throughout the State of North Carolina. Without such cooperation, the development and printing of the North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum would not have been possible.

We wish to express a special thanks to:

- the North Carolina General Assembly for providing the funds to make this important work possible,
- more than 8000 local educators who participated in the writing of the documents and in reacting to early drafts,
- almost 300 persons from institutions of higher education who advised the staff and assisted in the development of the curriculum,
- Raleigh-based and regional staff in the Divisions of Arts Education, Communication Skills, Computer Services, Exceptional Children, Healthful Living, School Media Programs, Mathematics, Science, Social Studies, Student Services, and Vocational Education. These Public Instruction staff members carried the primary responsibility for planning, writing, and editing the curriculum.
- the Controller's Office in the Department of Education for excellent assistance in designing a computer program for storing and printing the Standard Course of Study and the competency-based curriculum,
- the Division of School-Community Relations for technical assistance in the publication of the documents,
- all areas of the Department of Public Instruction for their encouragement and invaluable assistance in numerous ways,
- Kay Barbour and Janice Royster who word-processed the entire 8000 pages, and
- especially Dr. Barbara Holland Chapman who coordinated the development of the Standard Course of Study and the competency-based curriculum. Her untiring efforts have contributed significantly to the quality of these documents.

The involvement of the entire education community in the writing of the curriculum truly makes it a North Carolina curriculum of which the State can be justifiably proud. We look forward in the coming years to working with all of you in revising and improving the competency-based curriculum in order that it will continue to meet the needs of the children of North Carolina.

Joseph B. Webb

Joseph B. Webb
Assistant State Superintendent
Instructional Services

# BACKGROUND AND OVERVIEW

# Introduction

Immediately following the passage of the Elementary and Secondary Reform Act in June of 1984, the area of Instructional Services within the North Carolina State Department of Public Instruction began a revision of the North Carolina Standard Course of Study and the development of the Teacher Handbook for the competency-based curriculum. These efforts represent a significant part of the development of a basic education program for North Carolina's Public Schools.

Three publications hold the results of our efforts to define a basic education program for the State: The Basic Education Program for North Carolina's Public Schools, North Carolina Standard Course of Study, and the Teacher Handbook for the competency-based curriculum. The Basic Education Program for North Carolina's Public Schools outlines the curriculum, programs not confined to subject areas, general standards, material support, and staffing which should be provided in all schools throughout the State. The North Carolina Standard Course of Study, adopted by the State Board of Education, provides an overview of the basic curriculum which should be made available to every child in the public schools of our State. It includes the subject or skills areas of arts education, communication skills, guidance, healthful living, library/media skills, mathematics, science, second language studies, social studies, and vocational education as well as the philosophy and rationale underlying the curriculum and considerations which should be made in developing thinking skills and providing for the needs of exceptional children. The Teacher Handbook for the competency-based curriculum provides recommended goals and objectives and suggested measures for each subject or skills area.

The first step taken in auditing and refining the curriculum in each subject or skills area was to review and synthesize the reports of curriculum review committees and the work contained in two earlier publications (Course of Study for Elementary and Secondary Schools K-12 and Competency Goals and Performance Indicators). The next step was to involve educators from local education agencies and institutions of higher education in working with the North Carolina Department of Public Instruction staff to expand and refine the curriculum. Thousands of persons throughout the State have been involved in the development of the North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum.

Three important points should be kept in mind when reviewing these documents. First, while the curriculum represents the standard course of study which should be available to all children in North Carolina Public schools, many public schools in the State presently offer an even more comprehensive curriculum. Second, the standard course of study includes the curriculum that should be made available to every child, not what every child is actually required to take. Required subjects or courses are outlined in the appendices.

Third, the North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum will never actually be completed. Several steps have been taken to insure that the curriculum may be constantly updated: the documents have been entered on an IBM 5520 computer word-processing program for ease of revision and updating; the competency-based curriculum has been produced in loose-leaf form so that revised or additional pages may easily be added; and included in each document is the name of a contact person within the State Department of Public Instruction to whom staff in local education agencies or others may send suggestions for additions or revisions (Appendix I). As with any viable curriculum, these documents must be constantly open to review, expansion, and revision in order that they continue to meet the needs of the children of the State of North Carolina.

# Philosophy and Rationale

The philosophy and rationale underlying the North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum imply a context in which the curriculum will be implemented. What follows are definitions of the purposes for which the curriculum was developed and the principles incorporated into its development as well as descriptions of who will implement it and where it will be successfully implemented.

## Purposes and Principles

The primary purposes of the North Carolina Standard Course of Study and the competency-based curriculum are (1) to help students become responsible, productive citizens and (2) to help students achieve a sense of personal fulfillment. It is clear that there are competencies which a student must develop in order to meet both of these purposes.

Students must develop the specific competencies needed to gain employment or continue their education. These competencies include critical thinking skills, skills with media and technology, and the basic content knowledge provided within a core curriculum (arts education, communication skills, healthful living, mathematics, science, second language studies, social studies, and vocational education).

Students must develop the skills and attitudes necessary to cope with contemporary society. Among these are a positive attitude toward oneself, a sense of independence and responsibility for oneself, an understanding of oneself and one's own culture, a positive attitude toward others including those who come from different cultures, a respect for the rights of others, a sensitivity to the needs and feelings of others, a sense of responsibility to others, a willingness to cooperate with others in working toward a common goal, and the ability to understand and cope with a constantly changing society.

In order to help students become responsible, productive citizens who have a sense of personal fulfillment, commonly accepted principles of learning have been incorporated into the North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum. One of these principles is the importance of integrating the curriculum--of emphasizing the understanding of concepts and processes over the mere acquisition of isolated facts. Stressing the mastery of integrated knowledge helps students to move from what is known to an understanding of the unknown, to see relationships and patterns and begin to make generalizations, to understand the interrelatedness of the subject areas and skills areas, and to succeed in learning. An integrated curriculum helps students learn how to learn.

Another principle considered in the development of the North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum is that learners are more likely to attempt those tasks at which they feel they can succeed and which are relevant to their lives. If students are to be successful in school and if they are to pursue lifelong learning, they must see learning as worthwhile. The competency-based curriculum is, therefore, a program of continuous learning based upon the individual student's needs, interests, and stages of development. The curriculum provides opportunities for the student to develop self-expression, to learn to communicate effectively, to maintain and develop both physical and emotional health, to choose among curriculum electives, and to become an active participant in the learning process. The importance of personalizing the curriculum to help each student reach her/his maximum potential is stressed.

## Effective Teachers

It is the classroom teacher at each grade level or in each subject area who has the most direct influence on the implementation of the North Carolina Standard Course of Study and the competency-based curriculum. The ultimate task of integrating the curriculum must be performed by the classroom teacher through preparation for instruction and presentation of content. Student success in learning is assured when teachers use the information gained through monitoring and evaluation to determine appropriate instructional tasks and to provide appropriate feedback to students. What the teacher presents and how the teacher presents it determines whether students feel the task is relevant to their lives. The teacher's efficient management of instructional time and student behavior are also important to the successful implementation of the curriculum in each classroom.

## Effective Schools

Several common characteristics will be present in the schools which most effectively implement the North Carolina Standard Course of Study and the competency-based curriculum. These characteristics include strong instructional and administrative leadership by the principal of the school, dedicated and qualified teachers, an emphasis on curriculum and instruction, a positive school climate, ongoing evaluation based on student achievement, and good home/school relations. Strong instructional and administrative leadership by the principal means that the principal functions as the instructional leader, supports instructional effectiveness by the way in which the school is managed, and clearly communicates the school's mission to staff, students, and parents. Dedicated and qualified teachers care about their students, understand and support school-wide goals and procedures, work as a team, exhibit positive morale and enthusiasm for their work, and demonstrate their good training through application of the skills involved in quality teaching. An emphasis on curriculum and instruction includes clearly stated school-wide goals and objectives, structured staff development based on the school's goals, curriculum continuity (alignment among school-wide goals, instructional approaches, materials used, and the assessment of students' needs, abilities, and interests), and a high percentage of student time-on-task. Elements of a positive school climate are a safe and orderly environment, a perceptible feeling of pride and school spirit in all that the school does, the communication of high academic and social expectations to students, and opportunities for student responsibility and involvement. Ongoing evaluation based on student achievement begins with early identification of students' needs, abilities, and interests, includes frequent monitoring of student progress in multiple ways (teacher observation, classroom activities, homework, teacher-made tests, mastery skills checklists, criterion-referenced tests), and results in appropriate instructional prescriptions to improve individual student performance and the school-wide instructional program. Good home/school relations are the outgrowth of effective, positive communication between the school and the home. This includes encouraging parents to help their children at home, making them feel they are appreciated by the school staff, and letting them know they are welcome in the school and have a part to play in school affairs. Good home/school relations increase parents' support of the school's instructional goals and disciplinary policies.

The characteristics described above will be found in the elementary, middle/junior high, and high schools which most effectively implement the North Carolina Standard Course of Study and the competency-based curriculum. However, in each of these schools consideration must be given to the unique development needs--intellectual, physical, social, and emotional--of the students served. For example, the need of young children for concrete, hands-on experiences; the need of middle school children for transitional experiences in curriculum choices, scheduling, and conseling; and the need of high school students for the variety of curriculum choices provided by the comprehensive high school.

The North Carolina Standard Course of Study and the competency-based curriculum represent a comprehensive, integrated course of study; however no document by itself has ever made the ultimate difference in the quality of education which children receive. Principals who function as instructional leaders and teachers who make use of their most effective teaching skills will appropriately implement the competency-based curriculum and thus insure that the children of North Carolina receive a quality education.

# Thinking Skills

In order to become productive, responsible citizens and to achieve a sense of personal fulfillment, students must develop the ability to think. Thinking skills should be developed and reinforced throughout the curriculum and during every activity of the school day. It is also important that students be helped to apply these skills to "real life" situations outside the school.

The most frequently used system for classifying thinking skills is Bloom's (1956) Taxonomy. This system, with adaptations made by Sanders (1966) and Soar et al. (1969), was used in the integration of thinking skills throughout the Teacher Handbook for the competency-based curriculum. These skills fall into seven broad categories--memory, translation, interpretation, application, analysis, synthesis, and evaluation.

The most basic thinking skills are memory and translation. Memory involves the ability to remember specific pieces of information or facts such as names, dates, events, and rules. Translation requires the student to remember specifics and to understand or express them in her/his own terms. One example of a translation skill is the student's ability to restate a classroom rule in her/his own words. Another example is the ability to read the mathematical symbol "+" as "plus".

Remembering isolated bits of information or even restating that information in one's own words does not necessarily require reasoning on the part of the student. Higher-level thinking skills are defined as those processes which require thinking or reasoning above the levels of memory or translation--interpretation, application, analysis, synthesis, and evaluation.

Students begin to demonstrate their ability to reason through interpreting information, applying what is learned in one situation to a new situation, and analyzing information. Ways in which a student might demonstrate the ability to interpret information are to list the similarities and differences between two or more objects or to tell why a particular classroom rule was established. A student demonstrates a degree of ability in the category of application when s/he is able to explain how the principle of representative government at the state and federal levels may apply to the election of officers to the student council. A student who reads a newspaper editorial and is able to distinguish fact from opinion, point out unstated assumptions, and recognize bias is demonstrating skills of analysis.

When students apply skills of analysis, they are taking apart a whole. When students apply synthesis skills, they are creating a whole that is unique or new to them. Synthesis is usually equated with creativity. Composing a song, building a model house, or formulating a hypothesis during a science experiment are examples of synthesis activities.

Evaluation is distinct from opinion in that evaluation is the conscious making of judgments based on evidence or criteria. Opinion is usually formed from an emotional or affective base. Students serving as jurors during a simulated trial are using evaluation skills or making judgments based on evidence. Students critiquing one another's writing based on established elements of style are using evaluation skills or making judgments based on criteria.

To insure that students develop higher-level thinking skills they should be guided in the use of these skills in each subject area at each grade level and in their application to "real life" situations. When developing lesson plans, teachers should prepare tasks and questions at a variety of cognitive levels. However, strict adherence to previously prepared questions may inhibit rather than enhance a class discussion. Furthermore, it is often difficult to think of appropriately worded higher-level questions in the midst of a good classroom discussion. The following simple strategies will lead to the asking of higher-level questions and the giving of higher-level responses:

1. Before starting an activity, explain to the learner what you are going to do.
2. Before starting an activity, give the learner time to familiarize her/himself with the materials.
3. Ask questions which require multiple word answers. (e.g., "Why did he choose that path?")
4. Ask questions which have more than one correct answer. (e.g., "What things make people happy?")
5. Encourage the learner to enlarge upon her/his answer. (e.g., "Tell us more about that.")
6. Get the learner to make judgments on the basis of evidence rather than by guessing. (e.g., "You said . . . Read the line in the book that made you think that.")
7. Give the learner time to think about the problem; don't be too quick to help. (e.g., Wait at least five seconds before prompting or asking another question.)
8. Get the learner to ask questions. (e.g., "If the astronaut were in our classroom, what questions would you ask her?")
9. Praise the learner when s/he does well or takes small steps in the right direction.
10. Let the learner know when her/his answer or work is wrong, but do so in a positive or neutral manner. (Desirable Teaching Behavior Task Force, 1976)

The following are examples of two levels of activities (K-1 and above K-1) within the seven categories of thinking skills and two categories of questions or statements (affectivity and procedure) outside the seven categories of thinking skills:

Florida Taxonomy of Cognitive Behavior--K-1 Form (Soar et al., 1969)

1. Memory--items at this level are intended to represent no activity other than rote memory. The pupil is expected to give back an idea in the same form it was given, without changing the nature of the idea or the form in which it was expressed.

    a. repeats from memory
    b. repeats other
    c. repeats in sequence
    d. choral response
    e. spells
    f. gives/receives information
    g. seeks information

2. Translation--the intent of this category is to identify pupil activities involved in changing the form in which an idea is expressed, but not in changing or manipulating the idea itself.

    a. sounds letters
    b. names pictures, objects, colors, letters
    c. copies letter, number, work (learned)
    d. gives/follows directions
    e. describes situation, event
    f. reports experience (2+ thoughts)
    g. describes situation, event
    h. recognizes word (sight words)
    i. translates one language into another or vice versa (e.g., math symbols into words or Spanish into English)
    j. asks/gives permission
    k. puts into own words

3. Interpretation--the activities in this category are those of making comparisons, identifying similarities or differences, identifying relatedness, or carrying out a process in which the child has previously been instructed, when told that the process is appropriate.

    a. sounds out word
    b. classifies (1 attribute)
    c. counts
    d. adds/subtracts
    e. uses units, tens
    f. compares letters, numbers
    g. copies letters(s), number(s)--learning
    h. gives class name (vehicle, etc.)
    i. identifies similarities, differences
    j. asks/gives reason (opinion)
    k. names sensation
    l. performs learned task or process
    m. relates terms (e.g., 1/first, little/small, purple/violet/lavender)
    n. makes comparisons
    o. describes what may be seen to be happening in a picture

4. Application--one of the central aspects of application is that the student is able to select from past learning that which is appropriate for the current situation, and apply it. In interpretation a process was carried out when specified, but here the pupil must decide her/himself what process should be applied. Organization and the interrelationships between two or more ideas are central.

   a. classification (2+ attributes)
   b. directs learning game
   c. creates arithmetic problem
   d. writes/types sentence
   e. asks/tells who, what, or where
   f. seriates (alphabetizes)
   g. applies previous learning to new situation
   h. reads (thought unit)
   i. selects and carries out process

5. Analysis--the central elements in this category are those of inferring causation, motivation, or feelings from information given about the setting and the behavior of the people involved, or of identifying information which supports a conclusion, or establishing the accuracy of a process. The selection and use of relevant supporting data is the central process.

   a. verifies equation balance
   b. infers feeling or motive
   c. infers causality (tells why)
   d. cites evidence for conclusions

6. Synthesis--the central idea of the synthesis category is that the child organize ideas in a way that is new to her/him, or projects probable consequences of a given behavior, or formulates a plan or set of rules to deal with anticipated difficulties, or produces something which is new to her/him.

   a. elaborates on picture or story
   b. proposes plan or rule
   c. play-acts
   d. makes up story
   e. makes fantasied object (e.g., sand or clay)
   f. makes common object (e.g., sand or clay)
   g. draws/colors common object
   h. draws/colors fantasied object
   i. makes predictions based on available facts

7. Evaluation--the central concept of evaluation is that there must exist a set of standards or criteria against which behavior or some sort of product is compared.

   a. compares with criteria or rule
   b. compares with plan

## *Florida Taxonomy of Cognitive Behavior* (Brown et al., 1968)

1. *Knowledge (memory)*

1.1 *Knowledge of Specifics*--requires the memorization of information or knowledge which can be isolated or remembered separately, the smallest meaningful bits.

a. reads
b. spells
c. identifies something by name
d. defines meaning of term
e. gives a specific fact
f. tells about an event

1.2 *Knowledge of Ways & Means of Dealing with Specifics*--requires knowledge about the manner in which specific information is handled--the ways of organizing, working, and evaluating ideas and phenomena which form the connecting links between specifics. It does not require the learner to deal actually with the specifics her/himself, but rather to know of their existence and possible use. Thus, s/he may be expected to state a previously encountered principle or generalization, but not to develop one. The items which belong to this category refer to *processes* rather than *products* of processes; they usually represent higher abstractions than the items of the preceding category.

a. recognizes symbol
b. cites rule
c. gives chronological sequence
d. gives steps of process, describes method
e. cites trend
f. names classification system or standard
g. names what fits given system or standard

1.3 *Knowledge of Universals & Abstractions*--deals with the highest of abstractions at the memory level. In order to evidence this behavior the individual must know major generalizations, their interrelations, and patterns into which information can be organized and structured. These items reflect the major concepts which comprise the framework of a discipline or major area of knowledge. The four items in this category are descriptions of behavior which would identify or verbalize a major concept.

a. states generalized concept or idea
b. states a principle, law, or theory
c. tells about organization or structure
d. recalls name of principle, law, or theory

2. *Translation*--is dependent upon possession of relevant knowledge. The task is to convert communication into known terms; it requires the understanding of the literal message in the communication. Communication is used here in its broadest sense; it could be a demonstration, a field trip, a musical work, a verbal message, or be demonstrated in pictorial or symbolic form.

   a. restates in own words or briefer terms
   b. gives concrete example of an abstract idea
   c. verbalizes from a graphic representation
   d. translates verbalization into graphic form
   e. translates figurative statement to literal statement or vice versa
   f. translates foreign language into English or vice versa

3. Interpretation--individual not only identifies and comprehends ideas, as in translation, but also understands their relationships. It goes beyond repetition and rephrasing the parts of a communication to determine the larger and more general ideas contained in it. Thus, comprehension may require reordering into a new configuration in the mind of a person, involving the determination of the relative importance of ideas and the interrelationships. However, the thinking is dependent upon what is given to the student--s/he is not expected to bring abstractions from other experiences into the situation.

   a. gives reason (tells why)
   b. shows similarities or differences
   c. summarizes or concludes from observation of evidence
   d. shows cause and effect relationship
   e. gives analogy, simile, metaphor
   f. performs a directed task or process

4. Application--individual must know an abstraction well enough to be able to demonstrate its use in a new situation. The task is to bring to bear upon given material or situation the appropriate information, generalizations or principles that are required to solve a problem. Application, as distinguished from comprehension, involves transfer of training. It is based on an individual's being able to apply previous learning to a new or novel situation without having to be shown how to use it. The problem itself is given.

   a. applies previous learning to a new situation
   b. applies principle to new situation
   c. applies abstract knowledge in a practical situation
   d. identifies, selects, and carries out process

5. Analysis--describes cognitive behavior in which there is an emphasis on the breakdown of material into its parts in order to detect the relationships of the parts and the way they are organized. The first four items at this level describe skills used in the identification or classification of the elements of the communication.

   a. distinguishes fact from opinion
   b. distinguishes fact from hypothesis
   c. distinguishes conclusions from statements which support it
   d. points out unstated assumption
   e. shows interaction or relation of elements
   f. points out particulars to justify conclusion
   g. checks hypothesis with given information

    h. distinguishes relevant from irrelevant information
    i. detects error in thinking
    j. infers purpose, point of view, thoughts, feelings
    k. recognizes bias or propaganda

6. Synthesis (creativity)--represents cognitive activities in which the individual puts together elements and parts in order to form a whole in such a way as to constitute a pattern or structure that was not stated before. This entails recombining parts of earlier experiences in a new organization that is unique to the synthesizer. In analysis, the person takes apart a given whole; in synthesis s/he creates a whole.

    a. reorganizes ideas, materials, processes
    b. produces unique communication or divergent idea
    c. produces a plan, proposed set of operations
    d. designs an apparatus
    e. designs a structure
    f. devises scheme for classifying information
    g. formulates hypothesis, intelligent guess
    h. makes deductions from abstract symbols, propositions
    i. draws inductive generalization from specifics

7. Evaluation--describes activities of conscious judgment making; involves use of criteria or standards to determine the worth or value of methods, materials, or ideas. Evaluations must be distinguished from opinions which are usually made from an emotional or affective base.

    a. evaluates something from evidence
    b. evaluates something from criteria

Noncognitive Categories of Questions/Statements or Tasks (Davis & Tinsley, 1967)

Affectivity--questions/statements or tasks which elicit feeling, emotion, or opinion without a standard of appraisal, e.g., "How does the story make you feel?" or "Wasn't that a good story!"

Procedure--questions/statements or tasks related to organization, behavior, or management, e.g., "Are you listening to me?" or "Please get ready for class to begin."

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# Programs for Exceptional Children

Exceptional children are (1) learners who because of permanent or temporary mental, physical, or emotional handicaps need special education and are unable to have all their educational needs met in a regular class without special education or related services, or (2) learners who demonstrate or have the potential to demonstrate outstanding intellectual aptitude and specific academic ability and, in order to develop these abilities, may require differentiated educational services beyond those ordinarily provided by the regular school program. Classifications of exceptional children include those who are autistic, academically gifted, hearing impaired (deaf or hard of hearing), mentally handicapped (educable, trainable, or severely/profoundly), multi-handicapped, orthopedically impaired, other health impaired, pregnant, behaviorally/emotionally handicapped, specific learning disabled, speech/language impaired, and visually impaired (blind or partially-sighted).

The primary purpose of exceptional children programs is to insure that handicapped and gifted learners develop mentally, physically, and emotionally to the maximum extent possible through the provision of an appropriate, individualized education in the proper setting.

Curricula for most exceptional learners follow the curricula designed for learners in general education. However, modification of instructional programs, creative instructional approaches, individualized programming, and appropriate selection and use of curricula are necessary to meet the special needs of exceptional learners. In curricula, emphasis must be given to instruction in arts education, communication skills, healthful living, mathematics, library/media skills, science, social studies, and vocational education. Attention must be focused upon cognitive, affective, psychomotor, and vocational development within the curricular areas. The Individualized Education Program for the handicapped and the Group Education Program for the academically gifted, both of which are based upon a comprehensive assessment, are to state in writing the special curricular offerings to be provided to each exceptional learner.

The Individual Education Program for the handicapped requires objective criteria, evaluation procedures, and schedules for determining, on at least an annual basis, whether or not short-term instructional objectives have been achieved. The Group Education Program for the academically gifted requires annual goals and evaluation methods. All special education instruction provided to handicapped and academically gifted learners is to be individualized and designed to meet unique learning needs.

Learning outcomes--knowledge, skills, concepts, understandings, and attitudes--for the handicapped and the academically gifted will differ from learner to learner. For many exceptional learners, the same learning outcomes developed for learners in general education will be appropriate. Some exceptional learners will meet the learning outcomes at a different time and in a different manner than learners in general education. Some handicapped learners might not meet the learning outcomes in general education and will need a totally different curriculum.

The majority of handicapped and academically gifted learners spend a portion of their instructional day within general education, integrated into classes with non-handicapped and nonacademically gifted learners. General education teachers, as well as exceptional education teachers, must be familiar with curricula and capable of selecting appropriate curricular goals and objectives based upon the unique educational needs of each learner as determined by comprehensive assessment, and as stated in the Individualized Education Program for exceptional learners, emphasis needs to be placed on instructional techniques rather than differentiated or modified curricula.

While the general education curricula are appropriate for most exceptional learners, there are times when the teacher must vary the curricular content: some children are not ready for certain types of curricular content at the usual age; some disabilities prevent or make difficult participation in certain learning experiences; different levels of ability may limit or encourage participation in certain school subjects; and some learners spend less time in school. Curricular choice is determined by need.

Curricular goals must be oriented toward skills and application instead of general knowledge. The goals must include skills related to maintaining health, communicating ideas, achieving personal and social growth, handling money concerns, working with measurements, getting along in an expanding community, coping with the physical environment, maintaining a home, using leisure time, and career development.

The competency-based curriculum is to be maximized for exceptional learners. Teachers must be familiar with the curriculum, making judicial use of it in the instructional program for handicapped and academically gifted learners.

# Notes to Those Using the TEACHER HANDBOOK

The North Carolina Standard Course of Study, adopted by the State Board of Education, provides an overview of the basic curriculum which should be made available to every child in the public schools of our State. It includes the subject or skills areas of arts education, communication skills, guidance, healthful living, library/media skills, mathematics, science, second language studies, social studies, and vocational education as well as the philosophy and rationale underlying the curriculum and considerations which should be made in developing thinking skills and providing for the needs of exceptional children. The Teacher Handbook for the competency-based curriculum provides recommended goals and objectives and suggested measures for each subject or skills area.

## Definitions

Competency Goals: broad statements of general direction or purpose.

Objectives: specific statements of what the student will know or be able to do.

Measures: a variety of suggestions for ways in which the student may demonstrate s/he is able to meet the objective.

## How to Read the Goals, Objectives, and Measures

Competency Goals have been written as complete sentences stating why the learner should be able to meet the stated objectives, e.g., "The learner will know causes and events of the settlement of the West."

For purposes of clarity and brevity Objectives have been written as phrases or clauses beginning with a verb, e.g., "Know the importance of railroads in the settlement of the West." These phrases or clauses would logically be preceded by "The learner will (know the importance of railroads in the settlement of the West)."

For purposes of clarity and brevity Measures have also been written as phrases or clauses beginning with a verb, e.g., "Describe the advantages of the railroad over horse-drawn wagon, river transportation, and other commonly used methods of transportation." These phrases or clauses would logically be preceded by "One way (or some ways) a student may demonstrate s/he is able to meet successfully the objective is to (describe the advantages of the railroad over horse-drawn wagon, river transportation, and other commonly used methods of transportation)."

Appendix E is an example of a page from the Teacher Handbook for the competency-based curriculum.

## Student Placement

From kindergarten through eighth grade each skill or subject area has been divided into grade levels. This was done in order to make it easier for teachers to gain a general idea of what should be covered at each grade level. In order that instruction fit the individual needs of each student, it is most important that the classroom teacher use the activities in the Measures column to determine the appropriate placement for each child. For example, if a second-grade student is not able to complete successfully the Measures in the reading skills section at the second-grade level, Measures at the first-grade or kindergarten level should be administered. When the base level at which the child can perform successfully has been determined, instruction should begin with and proceed from that level of Competency Goals and Objectives.

The Measures column includes a variety of suggested means for assessing student performance including informal measurements (e.g., manipulatives, oral reports, role playing, projects, and some paper and pencil activities) and formal measurements (e.g., items for teacher-made tests, criterion referenced tests, and/or standardized tests). Some of the items in this column may be administered in whole-group or small-group situations; others should be given only to individual students. These items may be used for the purpose of pretesting to determine appropriate student placement, for monitoring ongoing student progress, and/or for post-testing to determine student learning.

It is apparent that in order for students to be placed appropriately for instruction (particularly in first through eighth grade), each teacher must have at least one, and preferably two or more, grade levels of the competency-based curriculum on each side of the grade s/he is teaching. It must be remembered that the higher the grade level the greater the span of students' needs and, therefore, the greater the need for a teacher to have a wider grade span of the curriculum available. An adequate grade span of the curriculum is also important for teachers of exceptional children at all grade levels.

## Responsibility for Implementation

The North Carolina Standard Course of Study specifies which skills and subjects are to be taught at each grade level from kindergarten through grade twelve. The skills to be taught or developed at all grade levels are communication skills, library/media skills, thinking skills, and affective skills. The subjects to be taught from kindergarten through grade six are arts education, healthful living, mathematics, science, second language studies, and social studies. The same subjects, with the addition of vocational education, are to be taught in grades seven through twelve.

The Teacher Handbook for the competency-based curriculum provides recommendations for what should be taught in each skills or subject area from kindergarten through eighth grade and in each course from ninth through twelfth grade. Each teacher's primary responsibility is to teach the subject(s) or courses which s/he is specifically assigned, as well as to help students develop thinking and affective skills. However, each teacher also has a responsibility for appropriately integrating other skills (communication, library/media) and subjects (arts, healthful living, mathematics, science, second language studies, social studies, and vocational education) into the skills or subject areas which are her/his specific assignment.

Teachers in departmentalized schools at the middle/junior high or secondary levels have a responsibility for integrating curriculum in several ways. These include: (1) the integration of curriculum within their subject area in order to help students to make a smooth transition from one level to the next, e.g., from English I to English II, from Algebra I to Algebra II, from French II to French III; (2) the appropriate integration and development of those skills which are every teacher's responsibility (thinking and affective skills); and (3) whenever appropriate, the integration of other skills and subjects into their specifically assigned subject or skills area.

The Teacher Handbook for the competency-based curriculum serves as a resource guide for the integration of all skills and subjects in departmentalized situations. Teachers may look over the curriculum within the specific skills or subject area for which they are responsible in order to determine the overall scope and sequence. They may look at the outlines for thinking and affective skills in order to determine which of those skills have been integrated into their particular segments of the curriculum or to determine how they may integrate additional thinking and affective skills. Looking over other skills and subject areas will help teachers determine what should be appropriately integrated into their own areas. For example, while it is a primary responsibility of the high school English teacher to teach writing and speaking skills, the high school social studies teacher must be familiar with those skills and has a responsibility for reinforcing those skills in the written and oral work done in the social studies classes. Prior to beginning written and oral reports the social studies teacher should review the writing and speaking skills portions of the communications skills curriculum, using these as guidelines for instruction and the development of student assignments. Similar examples could be given with mathematics and science teachers or English and vocational education teachers.

Teachers in self-contained classrooms at the elementary, middle/junior high, or high school levels have the primary responsibility for integrating the curriculum in a variety of ways. These include: (1) integrating the curriculum within each skills or subject area in order to help students make a smooth transition from one grade level to the next; (2) integrating thinking skills and affective skills throughout all areas of the curriculum; (3) the integration of skills and subjects whenever possible though units of study;

(4) integrating skills and subjects introduced by teachers or specialists outside the homeroom into what is being taught within the homeroom; and (5) coordinating the efforts of teachers outside the homeroom (teachers of arts education, physical education, exceptional children, and library/media specialists, or guidance counselors) in order to supplement the homeroom curriculum. The Teacher Handbook for the competency-based curriculum serves as a guide for the integration of skills and subjects in self-contained situations as it does in departmentalized situations.

The principal shares in the responsibility for the successful implementation of the competency-based curriculum. The implementation and integration of the curriculum should be the focal point for decisions made by the principal in the role of instructional and administrative leader. Decisions made with respect to scheduling, disposition of student discipline, uninterrupted time for classroom instruction, and the distribution of materials and supplies may each serve to facilitate or frustrate the successful implementation and integration of the curriculum.

Staff within the area of Instructional Services at the North Carolina Department of Public Instruction also share responsibility for the successful implementation of the competency-based curriculum. Staff from the Regional Education Centers and Raleigh are, of course, available to assist Local Education Agencies in the implementation of the curriculum.

## Use of Textbooks

The North Carolina Standard Course of Study is the curriculum approved for the public schools of North Carolina. Textbooks supplement this curriculum. With reference to their appropriateness for use with the North Carolina Standard Course of Study, textbooks are reviewed and recommended by the Textbook Commission. The State Board of Education then adopts a list of textbooks from which school districts make individual selections. Appendix G is a description of this process. If textbooks are at variance with the curriculum, the North Carolina Standard Course of Study takes precedence.

## Computer Access

The North Carolina Standard Course of Study and the Teacher Handbook for the competency-based curriculum (with the exception of mathematics grades 7-12) have been entered on the IBM 5520 computer at the State Department of Public Instruction. Each skills or subject area at each grade level has been entered as a separate document. This allows Local Education Agencies, Institutions of Higher Education, and others with access to the mainframe in Raleigh to call up and print out any portion of the curriculum, e.g., any skills or subject area across all grade levels, all skills and subjects for one particular grade level, one subject at one grade level, or the entire competency-based curriculum. Those with access to the mainframe will, therefore, have immediate access to any revisions or additions to the curriculum.

## Activities and Resources

The development or cataloging of activities and resources to assist in the implementation of the competency-based curriculum is an ongoing activity of Instructional Services staff working with teachers and others in each of the Local Education Agencies. Concentrating this effort in the local school districts provides teachers the opportunity to become familiar with the curriculum. As activities and resources are developed for each skills or subject area, they will be made available for State-wide dissemination through the IBM mainframe.

## Working Space

Working space has been left at the end of goals throughout the Teacher Handbook for the competency-based curriculum. This space has been provided so that teachers may write in additional objectives and measures and/or make notes regarding instruction, activities, and resources.

## How to Make Suggestions for Additions or Revisions

As with any viable curriculum, the Teacher Handbook for the competency-based curriculum must be open to constant review, expansion, and revision in order that it continue to meet the needs of the children of this State. Anyone having suggestions for additions to or revisions of this curriculum may complete and submit the form in Appendix I, or may contact:

Joseph B. Webb
Assistant State Superintendent
for Instructional Services
Education Building
Raleigh, NC 27611

# Mathematics

## COMPETENCY-BASED CURRICULUM

NORTH CAROLINA DEPARTMENT OF PUBLIC INSTRUCTION

# MATHEMATICS

## PURPOSE AND OVERVIEW

The primary goal of mathematics education is to ensure that every child will become mathematically literate. Both the individual student and society are the beneficiaries when this is accomplished. Mathematics literacy is a necessity for everyone, not only the professional who chooses a career in mathematics or in a field which makes use of mathematics.

The more sophisticated and complicated world we live in today has significant implications for the curriculum as a whole and for mathematics in particular. Modern technology makes it imperative that every citizen have some understanding of mathematical reasoning and that, at every level of proficiency, a much larger group have an understanding of mathematical method.

The mathematics program adopted here is by necessity broader and more inclusive than in the past. It must develop more than vocabulary, facts, and principles; more than the ability to analyze a problem situation; more than an understanding of the logical structure of mathematics.

A modern mathematics program must provide students with the ability to distinguish fact from opinion, relevant from irrelevant data, and experimental results from proven theorems. This program has to stimulate curiosity so that students will enjoy exploring new ideas and creating mathematics which is new for them even though it has been discovered by others. It must develop reading skills, motivation, and study habits essential for the independent learning of mathematics. In short, the mathematics program must produce students who know how to learn mathematics, enjoy learning mathematics, and are motivated to continue this learning.

Computers and calculators should be integrated into the mathematics curriculum in imaginative ways. In addition to being used in numerical calculations, they should be used to clarify concepts and computational algorithms. They should be used extensively in problem-solving situations, as they enable a student to attack a problem from different points of view.

# COURSE OF STUDY

K-6
Elementary Mathematics

7-8
Middle School/Junior High Mathematics

9-12

| Non-College Preparatory | College Preparatory |
|---|---|
| General Mathematics | Algebra I |
| Technical Mathematics | Geometry |
| Consumer Mathematics | Algebra II |
| Introductory Algebra (Part 1) | Advanced Mathematics |
| Introductory Algebra (Part 2) | |

Many school districts offer other electives which are not part of the State-funded basic education program but which are appropriate to this instructional area. Such electives may include: Advanced Placement Calculus, Advanced Placement Computer Science, Computer Applications, and Probability and Statistics. Some schools, instead of offering Advanced Mathematics as a one-year, one-unit course offer quarter or semester courses in Analytic Geometry, Trigonometry, and Advanced Algebra. These courses, when offered in this manner, should be considered as part of the basic education program.

The mathematics competency-based curriculum:

- is designed for statewide use.
- is not correlated with any textbook and does not restrict the use of any relevant textbook or program.
- encourages the offering of a series of courses suitable to varying abilities of all students. For example, schools often offer Algebra I below grade 9.
- assumes that there are individual differences among students and that the degree and rate of achievement will vary among them.

- assumes that teachers have different methods, and will approach the teaching of mathematics differently.

- stresses a balance of concept learning, computational processes, and problem-solving.

## LEARNING OUTCOMES

In addition to the formal mathematical concepts and skills that students acquire on a continuing basis, there are other benefits derived from the study of mathematics. Students develop attitudes relative to mathematics and its importance in their lives, and they acquire skills which enable them to process information, analyze data, and draw conclusions essential to sound decision-making.

1. Positive Attitudes Concerning:

   a. The contributions of mathematics, science, and technology in shaping the world in which people live--adverse as well as beneficial effects.

   b. The role of mathematics in helping people meet their responsibilities to society.

   c. The learning and experiencing of mathematics.

   d. The use of scientific inquiry as a way of thinking and evaluating all human activity.

   e. The historical development of mathematics.

2. Process Skills

   a. Observing
   b. Classifying
   c. Using space/time relations
   d. Using numbers
   e. Communicating
   f. Measuring
   g. Inferring
   h. Predicting
   i. Interpreting data
   j. Formulating hypotheses
   k. Formulating models

3. Mathematical Concepts and Skills

   At each grade level or in each course outlined, mathematical concepts and skills are continuously developed and reinforced.

# GRADES K-3

## Major Emphases

All 5 to 9 year olds should have opportunities to participate in activities conducive to developing mathematical concepts. Concepts are the premises, foundations, and structures of thinking. Their development is a gradual and life-long process, going through many changes--probably never becoming static. All early ideas of mathematics grow out of observing what happens in the world. Logical reasoning ability develops through actual manipulation of objects in the physical world. The searching, exploring, and inquiring nature of children 5 to 9 years of age promotes the development of concepts that are prerequisite to effective learning in mathematics.

The major emphases in grades K-3 should be placed on:

- activities which involve the total physical being of each learner in exploring spatial relationships in the world around her/him.

- manipulation of real objects to give meaning to numbers and operations.

- experimentation which leads to discovery of numerical and geometrical relationships.

- applications which enable students to work with numbers to solve problems.

Appropriate use of computers and calculators will enhance and enrich the mathematics program at these grade levels.

## Grade K Outline

1. Numeration
    - a. Identify numerals, 0 to 10.
    - b. Compare sets with up to 10 objects.
    - c. Do rote counting, 0 to 20.
    - d. Use one-to-one correspondence.
    - e. Use ordinal numbers, first through third.
    - f. Classify objects using specific attributes.
2. Whole Numbers
    - a. Combine two sets of objects.
    - b. Determine the larger of two sets of objects.
    - c. Divide a set into two equal sets.
    - d. Determine the value of a set when one object is taken away.
3. Fractions
    - a. Identify objects that have been divided into two parts.
    - b. Identify objects that have been divided into halves.
4. Measurement
    - a. Use direct comparison to classify and determine the size of objects.
    - b. Identify before and after.
    - c. Identify coins and use value of pennies and nickels.
    - d. Use hour and minute references in daily vocabulary.
5. Geometry
    - a. Recognize simple plane and solid figures, e.g., square, triangle, circle, box, and ball.
    - b. Identify simple geometric patterns.
    - c. Classify objects by size, position, and shape.
    - d. Build similar figures.
6. Probability and Statistics
    - a. Read simple informational charts.
    - b. Read simple horizontal and vertical bar graphs.

## MATHEMATICS

**Grade Level:** K **Skills/Subject Area:** Numeration

**COMPETENCY GOAL 1:** The learner will identify and use whole numbers, 0 to 10.

| Objectives | | Measures | |
|---|---|---|---|
| 1.1 | Use one-to-one correspondence. | 1.1.1 | Match shoelace to shoe, spoon to fork, etc. |
| | | 1.1.2 | Join names to classmates orally, or with name tags. |
| 1.2 | Rote count from 0 to 20. | 1.2.1 | Fill in interval orally: "1,2,3,...,7,8,9." |
| | | 1.2.2 | Count objects in a given set. |
| 1.3 | Order sets from 0 to 9. | 1.3.1 | Order sets in math center, least to most. |
| | | 1.3.2 | Given a set of linked Unifix cubes, build a set that comes before and one that comes after. |
| 1.4 | Recognize numerals 0 through 10. | 1.4.1 | Given a number, match an appropriate set of counters. |
| | | 1.4.2 | Find 6 on a number line. |
| 1.5 | Estimate the number of objects in a set (up to 10). | 1.5.1 | Estimate the number of jelly beans in a jar, or Unifix cubes on a string. |
| | | 1.5.2 | Compare two sets of dominoes. Estimate the total number. |
| 1.6 | Use ordinal numbers, first through third. | 1.6.1 | Use a set of blocks and put the third block behind your back. |
| | | 1.6.2 | In a line of students, identify the first student, second student, etc. |
| 1.7 | Identify empty sets. | 1.7.1 | Use a set of Unifix cubes and note the contrast between a set of five and an empty set. |
| | | 1.7.2 | Order sets, including the empty set. |

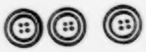
COMPETENCY GOAL 1: The learner will identify and use whole numbers, 0 to 10.

| Objectives | Measures |
|---|---|
| 1.8 Identify "one more than..." | 1.8.1 Find the set that has one more than a given set of counters.<br>1.8.2 A set of 9 is one more than a set of ?. |
| 1.9 Use ordinal numbers in vocabulary. | 1.9.1 Give a number story using 3 objects.<br>1.9.2 Instruct the first person, third person, etc., in line to respond. |
| 1.10 Identify the value of a set of up to 6 objects. | 1.10.1 Use dominoes, an overhead projector, or a board, and give the number in a set of dots (array).<br>1.10.2 Given a number, make an array of counters to represent the number. |
| 1.11 Sort objects using specific attributes. | 1.11.1 Gather all items possessing one attribute into a collection basket, e.g., all green blocks.<br>1.11.2 Use toy vehicles and park all of one kind in milk carton garages, i.e., by color, make, or type. Continue sorting using two attributes. |
| 1.12 Classify given objects. | 1.12.1 Label all blocks according to groups such as kind, color, or number of sides.<br>1.12.2 Classify rods according to length. |

MATHEMATICS

**Grade Level:** K **Skills/Subject Area:** Whole Numbers

**COMPETENCY GOAL 2:** The learner will demonstrate the ability to use whole numbers.

| Objectives | Measures |
|---|---|
| 2.1 Combine two sets and verbally describe the sets. | 2.1.1 Use counters to make two sets. Give a number story to explain the larger, combined set. |
| | 2.1.2 Participate when two groups of classmates combine into one group. Tell about the new group. |
| 2.2 Identify a new set as larger when combined with another, except when the empty set is employed. | 2.2.1 Orally compare the size of the new set. |
| | 2.2.2 Use identical objects. Combine 2 sets, both closely bound as in boxes. Discuss the need for a larger space for the combined sets. |
| 2.3 Remove one object from a set. | 2.3.1 Share one object from her/his collection. Orally describe the new set. |
| | 2.3.2 In a set of four blocks, draw around each one. Remove a block. Identify how many are left, and note the area vacated by the missing block. |
| 2.4 Make two new sets from one given set. | 2.4.1 Divide a set of books into two sets of books. |
| | 2.4.2 Cut apart a picture of a set:<br> |
| 2.5 Equally share a given set of objects with peers. | 2.5.1 Distribute to one other child a set of counters or Unifix cubes, which is equal in value to yours. |
| | 2.5.2 Distribute equal sets of counters or Unifix cubes, among a group of four people. Describe what happens. |

## MATHEMATICS

**Grade Level:** K Skills/Subject Area: Fractions

**COMPETENCY GOAL 3:** The learner will demonstrate an understanding of fractions.

| Objectives | Measures |
|---|---|
| 3.1 Identify objects that have been divided into two parts. | 3.1.1 Identify fruit that has been divided into two parts, and fruits with more than two parts. |
| | 3.1.2 Given a chart with figures divided into two or more parts, identify figures that have been divided into two equal parts. |
| 3.2 Identify the figures that have been divided into halves. | 3.2.1 Compare apples cut into halves with apple parts that have been cut unevenly. |
| | 3.2.2 Sort halves from irregular parts. |

# MATHEMATICS

Grade Level: K Skills/Subject Area: Measurement

COMPETENCY GOAL 4: The learner will develop concepts of measurement.

| Objectives | Measures |
|---|---|
| 4.1 Classify objects according to size. | 4.1.1 From a box of blocks, sort all short and tall ones or large and small ones. |
| | 4.1.2 Arrange objects of a given set as short, medium, or tall. |
| 4.2 Determine size by direct comparison. | 4.2.1 Using a model, compare items that are smaller, shorter, etc. |
| | 4.2.2 Find an item in the room to compare with a given model. |
| 4.3 Use comparative phrases in vocabulary. | 4.3.1 Write simple number stories, using words like taller, shorter, larger, or smaller. |
| | 4.3.2 Answer specific questions, using appropriate measurement terminology, e.g., longer, shorter, taller, thinner. |
| 4.4 Order items according to size. | 4.4.1 Arrange males and females from shortest to tallest. |
| | 4.4.2 Arrange balls, books, etc., from largest to smallest. |
| 4.5 Determine which activity takes the most or least time. | 4.5.1 Discuss time for lunch, night sleep, riding to school. Which activity takes the most time? |
| | 4.5.2 Determine who finishes first when half the class sings a song while the others run a short race. |
| 4.6 Identify the order of events. | 4.6.1 Look at a series of pictures; discuss depicted activity and decide which event was first. |
| | 4.6.2 Plan a cooking activity. Decide what to do first. Then sequence other events. |

COMPETENCY GOAL 4: The learner will develop concepts of measurement.

| Objectives | | Measures |
|---|---|---|
| 4.7 Use hour and minute in vocabulary. | 4.7.1 | Estimate how long it takes to walk from the classroom to the cafeteria. |
| | 4.7.2 | Discuss and time a long activity, or several short activities. |
| 4.8 Identify an appropriate season for activity. | 4.8.1 | Chart sports, appropriate dress, and holidays for different times during the year. |
| | 4.8.2 | Compare weather versus clothes, orally or on a chart. |
| 4.9 Identify the coins penny and nickel. | 4.9.1 | Sort a set of coins by pennies and nickels. |
| | 4.9.2 | Name a given coin. |
| 4.10 Demonstrate the value of a penny and a nickel. | 4.10.1 | Make a set of 6 pennies and tell how much. |
| | 4.10.2 | Make a set of 5 cents in two ways. |

Grade Level: K Skills/Subject Area: Geometry

COMPETENCY GOAL 5: The learner will develop an awareness of geometric shapes.

| Objectives | | Measures | |
|---|---|---|---|
| 5.1 | Informally recognize plane figures (i.e., circles, triangles, squares) and solid figures (i.e., boxes, balls, squares, circles). | 5.1.1 | Discuss attributes of plane and solid figures e.g., roundness, corners, sides. |
| | | 5.1.2 | Choose a shape from a box containing several shapes. Identify the shape. |
| 5.2 | Recognize positions of objects such as open, beside, inside, outside, above, or below. | 5.2.1 | Orally state an object's position. |
| | | 5.2.2 | Place an object in a stated position. |
| 5.3 | Classify objects by size and shape. | 5.3.1 | Orally classify objects in a mixed group, e.g., all objects which are round, or round and large. |
| | | 5.3.2 | Build an airplane using only rectangular shapes. |
| 5.4 | Recognize patterns using geometric shapes. | 5.4.1 | Identify part of a given pattern. |
| | | 5.4.2 | Extend a given pattern. |
| 5.5 | Build similar figures. | 5.5.1 | Given a physical model, build a similar figure by choosing blocks needed from a pile. |
| | | 5.5.2 | Use a set of blocks and build a figure similar to that shown in a picture. |

Grade Level: K

COMPETENCY GOAL 6: The learner wil
statistics.

| Objectives | |
|---|---|
| 6.1 Read informational charts. | 6.1. |
| | 6.1. |
| 6.2 Read horizontal and vertical bar graphs. | 6.2. |
| | 6.2. |

MATHEMATICS

Skills/Subject Area: Probability & Statistics

1 develop an understanding of probability and

| | Measures |
|---|---|
| 1 | Answer specific questions concerning a given chart, e.g., more, less, how many. |
| 2 | Compare and explain information on a given chart. |
| 1 | Answer specific questions concerning a graph. |
| 2 | Compare and explain information contained on a bar graph. |

## Grade 1 Outline

1. Numeration
    - a. Recognize numerals, 0 to 100.
    - b. Order numbers, 0 to 100.
    - c. Write a two-digit number using expanded notation.
    - d. Regroup ones to tens, tens to a hundred.
    - e. Use ordinal numbers, first through tenth.
    - f. Skip count by 2's, 5's, and 10's.
    - g. Identify odd and even numbers up to twenty.
    - h. Recognize "one more than" and "one less than".

2. Whole Numbers
    - a. Add numbers, 0 to 20.
    - b. Subtract numbers, 0 to 20.
    - c. Find the sum of three one-digit addends.
    - d. Add and subtract two two-digit numbers without regrouping.
    - e. Add multiples of ten with sums to 100.
    - f. Subtract a multiple of ten from any two-digit number.
    - g. Find sums of money less than one dollar.
    - h. Count equal sets repeatedly.
    - i. Use division concepts in sets and on regions.

3. Fractions
    - a. Identify sets and regions that have been divided into halves, thirds, and fourths.

4. Measurement
    - a. Compare objects using nonstandard units.
    - b. Sequence events.
    - c. Identify values of all coins.
    - d. Tell time to the nearest hour and half-hour.

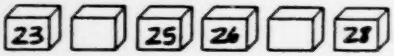
5. Geometry
    - a. Sort and classify objects by position.
    - b. Repeat geometric patterns.
    - c. Identify open and closed figures.
    - d. Construct similar figures.
    - e. Identify geometric shapes that are symmetrical.

6. Probability and Statistics
    - a. Read and interpret simple horizontal and vertical bar graphs.
    - b. Design and construct graphs and charts from given information.

# MATHEMATICS

Grade Level: 1 Skills/Subject Area: Numeration

COMPETENCY GOAL 1: The learner will identify and use whole numbers, 0 to 100.

| Objectives | Measures |
|---|---|
| **1.1 Recognize and match the value of numerals up to 100.** | **1.1.1 Determine the number of Unifix cubes by counting a given set of cubes, linking them into groups of ten, and grouping the tens and ones.** |
| | **1.1.2 Given a set of Unifix cubes grouped into tens and ones, identify or write the appropriate numeral.** |
| **1.2 Estimate the number in a set containing as many as 20 objects.** | **1.2.1 Given a set of Unifix cubes grouped into tens and ones, estimate the value. Check by counting.** |
| | **1.2.2 Given a set of Unifix cubes, estimate if the amount is closest to 8 or 18. Group sets into tens and ones and count to check the estimate.** |
| **1.3 Order numbers from 0 to 100.** | **1.3.1 Given a set of cards, e.g., 23, 42, 90, 71, and 38, order the cards in the proper sequence.** |
| | **1.3.2 Given a series of numbers in sequence, determine what number is missing.** |
| |  |
| **1.4 Group ones to ten, tens to hundreds.** | **1.4.1 Given a set of counters or Unifix cubes, group into hundreds, tens, and ones.** |
| | **1.4.2 Given a set of counters or Unifix cubes, grouped into hundreds, tens, and ones, identify the number of tens, hundreds, and ones.** |

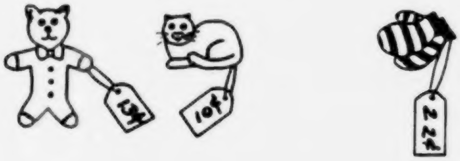
COMPETENCY GOAL 1: The learner will identify and use whole numbers, 0 to 100.

| Objectives | Measures |
|---|---|
| 1.5 Write two-digit numerals. | 1.5.1 Write the number for 5 tens and 8 ones. |
| | 1.5.2 Write the number that comes after 49. |
| 1.6 Recognize "one less than...". | 1.6.1 Given a number, find the number that is "one less than". |
| | 1.6.2 Make a set of counters that is one less than a given set. |
| 1.7 Use ordinal numbers, first through tenth. | 1.7.1 Given 10 objects in a row, identify the fourth one. |
| | 1.7.2 Arrange a given set in order, first through tenth or vice versa. |
| 1.8 Skip count by 2's, 5's, and 10's. | 1.8.1 Count a given set of counters by grouping them into 2's, 5's, and 10's. |
| | 1.8.2 Put number cards into correct order, e.g., 2, 4, 6,...; 5, 10, 15,...; 10, 20, 30,... |
| 1.9 Identify odd and even numbers. | 1.9.1 Pair counters to determine odd and even sets. |
| | 1.9.2 Find patterns for odd and even numbers in sequences. |

MATHEMATICS

**Grade Level:** 1 **Skills/Subject Area:** Whole Numbers

**COMPETENCY GOAL 2:** The learner will be able to compute using whole numbers.

| Objectives | | Measures | |
|---|---|---|---|
| 2.1 | Find sums to 20. | 2.1.1 | 3 + 5 = ? |
| | | 2.1.2 | $\begin{array}{r} 7 \\ +6 \\ \hline \end{array}$ |
| 2.2 | Identify fact families. | 2.2.1 | Use six counters to find all patterns of facts within the set of six. |
| | | 2.2.2 | Keeping the sum constant, tell what happens to the second addend when the first addend is increased or decreased. |
| 2.3 | Find sum, given three addends. | 2.3.1 | $\begin{array}{r} 4 \\ 3 \\ +5 \\ \hline \end{array}$ |
| | | 2.3.2 | Answer orally: 6 + 6 + 3 = ? |
| 2.4 | Add, using 2 two-digit numbers without regrouping. | 2.4.1 | $\begin{array}{r} 56 \\ +23 \\ \hline \end{array}$ |
| | | 2.4.2 | You have 45 pennies. I have 43 pennies. How many pennies in all? |
| 2.5 | Add 2 multiples of 10 with sums to 100. | 2.5.1 | $\begin{array}{r} 40 \\ +50 \\ \hline \end{array}$ |
| | | 2.5.2 | Answer orally: Tim has 20 shells. Paul has 30 shells. How many in all? |
| 2.6 | Find sums of money less than one dollar. | 2.6.1 | Add the prices of items presented in the set:<br><br> |
| | | 2.6.2 | Answer orally: How much money do you need to buy the toys? |

COMPETENCY GOAL 2: The learner will be able to compute using whole numbers.

| Objectives | Measures |
|---|---|
| 2.7 Find addition patterns. | 2.7.1 Tell what happens to "six" when you add one more two more, three more? Continue the pattern. |
| | 2.7.2 Answer:<br>"Eight and one more equals?"<br>"Nine and one more equals?" |
| 2.8 Subtract using numbers 0 to 20. | 2.8.1 Subtract: $\begin{array}{r} 9 \\ \underline{-3} \end{array}$ |
| | 2.8.2 Give a number story illustrating the subtraction fact shown: $\begin{array}{r} 14 \\ \underline{-6} \end{array}$ |
| 2.9 Subtract using "families" of facts. | 2.9.1 Find the related facts within a given set of counters. |
| | 2.9.2 Tell what happens to the difference of two numbers when the number taken away increases/decreases. |
| 2.10 Subtract a multiple of 10 from any two-digit number. | 2.10.1 95 - 70 = ? |
| | 2.10.2 Answer orally: Holly had 40 stickers. She gave Burt 30. How many did Holly have left? |
| 2.11 Subtract two-digit numbers without renaming. | 2.11.1 $\begin{array}{r} 47 \\ \underline{-15} \end{array}$ |
| | 2.11.2 Answer: Sam has 26¢ to spend. He bought a toy for 15¢. How much does he have left? |
| 2.12 Count multiple sets of two's. | 2.12.1 Count classmates who are in a double line. |
| | 2.12.2 Sort Unifix cubes into sets of two and count a container of them. |

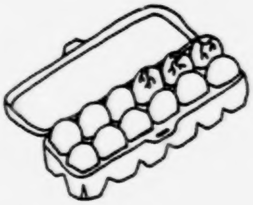
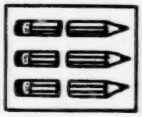
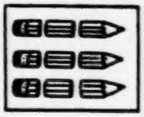
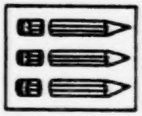
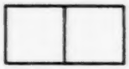
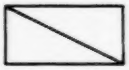
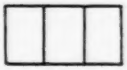
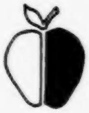
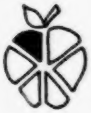
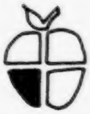
COMPETENCY GOAL 2: The learner will be able to compute using whole numbers.

| Objectives | Measures |
|---|---|
| 2.13 Find counting patterns with multiple objects. | 2.13.1 Given a set of Unifix cubes or counters, find ways to group and count by 2's, 3's, and 5's. |
| | 2.13.2 Discover other ways to count objects, or classmates, by grouping by 2's, 3's, and 5's. |
| 2.14 Identify objects which have been sorted equally. | 2.14.1 Discern if classmates have equally distributed items that have been taken from set. |
| | 2.14.2 Identify sets which are divided into equal parts. |
| 2.15 Identify regions that have been divided into equal parts. | 2.15.1 Find spaces e.g., windows and window panes which are equally divided. |
| | 2.15.2 Which blocks have been divided into equal parts? |

# MATHEMATICS

**Grade Level:** 1 Skills/Subject Area: Fractions

**COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their application.**

| Objectives | Measures |
|---|---|
| **3.1 Identify sets that have been divided into halves, thirds, and fourths.** | 3.1.1 What fraction of the dozen eggs are broken?  (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ |
| | 3.1.2 Which set of pencils is divided into halves?    |
| **3.2 Identify regions that have been divided into halves, thirds, and fourths.** | 3.2.1 Circle each figure that shows one half. (Two answers).    |
| | 3.2.2 Choose the apple that shows one fourth.    |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.3 Choose the correct fraction for a given set, region. | 3.3.1 Use a set of counters. Divide a set of counters into four equal sets. Match the given sets with the correct fraction. |
| | 3.3.2 Fold a piece of paper into four equal parts. Color one fourth of the paper red. |

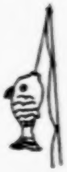
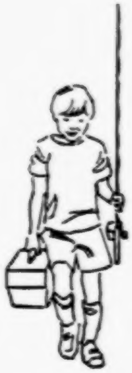
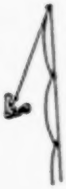
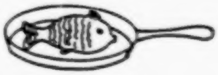
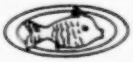
# MATHEMATICS

**Grade Level: 1** **Skills/Subject Area: Measurement**

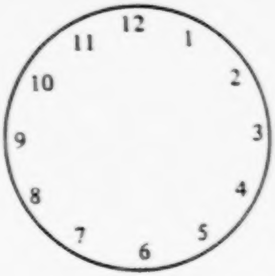
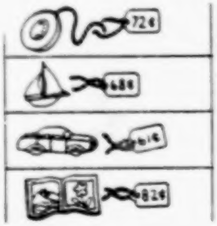
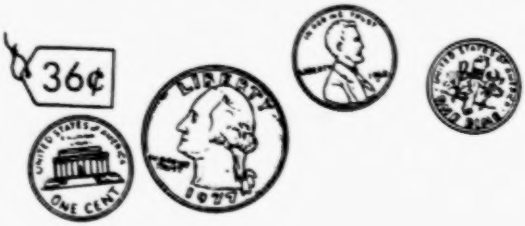
**COMPETENCY GOAL 4: The learner will exhibit skill in using nonstandard units of measurement.**

| Objectives | Measures |
|---|---|
| 4.1 Determine size of objects using nonstandard units. | 4.1.1 Given a small paper clip and several line segments, determine the length of each segment in paper clips. |
| | 4.1.2 Given a stack of several books, use a bean to find how tall the stack is. |
| 4.2 Use "centimeter" and "inch" in vocabulary. | 4.2.1 Use "centimeter" and "inch" to describe the size of an object. |
| | 4.2.2 Answer questions such as, "When you measure how long the book is, do you find out how many centimeters it is long or how many miles it is long?" |
| 4.3 Determine weight by nonstandard units. | 4.3.1 Compare weights of classmates on a seesaw. |
| | 4.3.2 Compare the weight of a can of food with a rock using hands or a balance scale. |
| 4.4 Determine volume by nonstandard units. | 4.4.1 Fill different size boxes with blocks. Determine the largest box. |
| | 4.4.2 Pour liquid from a large container to smaller ones. Sequence the containers according to volume. |

**COMPETENCY GOAL 4: The learner will exhibit skill in using nonstandard units of measurement.**

| Objectives | Measures |
|---|---|
| 4.5 Identify which event happened before, and which event happened after. | 4.5.1 Match:<br>First<br>Second<br>Third<br><br><br><br>4.5.2 What happens next?<br><br> |
| 4.6 Order 3 or more events. | 4.6.1 Use a picture chart for discussion. Ask what happened first, second, etc.<br>4.6.2 Read a story. Question the order of events. |
| 4.7 Use days of the week in vocabulary. | 4.7.1 Ask questions contrasting weekend and school days.<br>4.7.2 Review events of the previous day, e.g., Tuesday, and plan the next day, e.g., Thursday. |

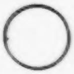
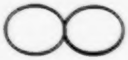
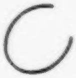
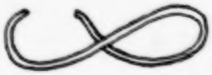
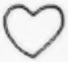
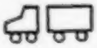
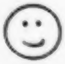
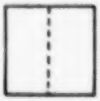
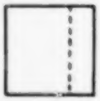
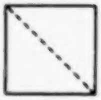
COMPETENCY GOAL 4: The learner will exhibit skill in using nonstandard units of measurement.

| Objectives | Measures |
|---|---|
| 4.8 Measure time to the hour and half-hour. | 4.8.1 Use a traditional clock and place the hands on a given time. Use a digital clock to show the time. |
| | 4.8.2 Draw hands on a clock, or use a model to move hands and show time, e.g., 2:00, 2:30, 5:30.<br> |
| 4.9 Solve simple time problems. | 4.9.1 Use a clock while telling a simple story involving time. |
| | 4.9.2 Find the time from the given information in a number story. |
| 4.10 Use the value of dime and quarter to solve problems. | 4.10.1 From the coins available, choose enough money to buy all the items in each list:<br> |
| | 4.10.2 Circle the coins you will need to buy each toy.<br> |

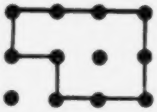
## MATHEMATICS

**Grade Level:** 1 **Skills/Subject Area:** Geometry

COMPETENCY GOAL 5: The learner will identify and use geometric shapes.

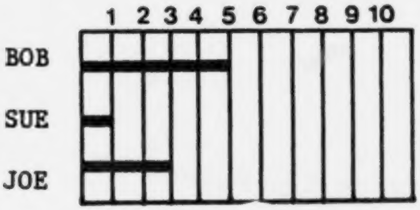
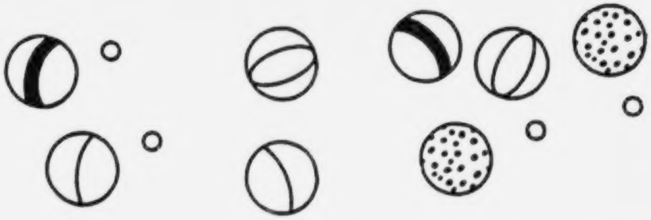
| Objectives | Measures |
|---|---|
| 5.1 Identify open and closed figures. | 5.1.1 Find the open figure:    |
| | 5.1.2 Use yarn to make an open figure such as:  |
| 5.2 Count the sides of a given shape. | 5.2.1 Find all the blocks that have four sides from from a given pile of pattern blocks. |
| | 5.2.2 Sort a given set of pattern blocks according to the number of sides. |
| 5.3 Describe and locate objects by position. | 5.3.1 Place the triangle near the line, under the box, over the dot, etc. |
| | 5.3.2 Tell which shapes are over the dotted line. |
| 5.4 Identify shapes that are symmetrical. | 5.4.1 Mark the pictures that are symmetrical:    |
| | 5.4.2 Fold your paper. Is it symmetrical?    |

**COMPETENCY GOAL 1:** The learner will identify and use geometric shapes.

| Objectives | | Measures | |
|---|---|---|---|
| 5.5 | Construct similar figures. | 5.5.1 | Make a triangle on a geoboard. Create another like it. |
| | | 5.5.2 | On a geoboard, make a six sided shape like this:<br> |
| 5.6 | Repeat a pattern using geometric shapes. | 5.6.1 | Continue the pattern using shaped blocks.<br>●■▲●■▲■●■ |
| | | 5.6.2 | Continue the pattern.<br>★●▲★●▲★●▲ |
| 5.7 | Build similar figures. | 5.7.1 | Given five blocks, build an airplane. Now use the same blocks to build another airplane. |
| | | 5.7.2 | Use three blocks to make a triangle. Use three larger blocks to make a triangle. |

**Grade Level:** 1 **Skills/Subject Area:** Probability & Statistics

COMPETENCY GOAL 6: The learner will begin to demonstrate an understanding of probability and statistics.

| | Objectives | | Measures |
|---|---|---|---|
| 6.1 | Read and interpret bar graphs. | 6.1.1 | Who read more books? |
| | | 6.1.2 | How many books did Bob read, etc.? |
| | | |  |
| 6.2 | Design and construct graphs and charts using given information. | 6.2.1 | Given data on chart, design a type of graph, e.g., pictorial and bar. |
| | | 6.2.2 | Organize to show data: count, sort, etc. |
| | | |  |
| 6.3 | Record outcomes from random number generators, e.g., tossing coins. | 6.3.1 | Tally the number of times "heads" or "tails" are tossed. |
| | | 6.3.2 | Construct a graph using tally results. |

## Grade 2 Outline

1. Numeration

   a. Order and compare numbers up to 1,000.
   b. Skip count by 3's and 4's.
   c. Write a given three-digit number in expanded form.
   d. Use word names for numerals.
   e. Round numbers to nearest ten.

2. Whole Numbers

   a. Add three-digit numbers with regrouping once.
   b. Subtract three-digit numbers without regrouping.
   c. Use multiplication concepts to determine the number of objects in a set.

3. Fractions

   a. Divide regions and sets into halves, thirds, and fourths.

4. Decimals

   a. Use decimals in writing money expressions.

5. Measurement

   a. Measure length using standard units: inch and centimeter.
   b. Measure temperature in Celsius and Fahrenheit degrees.
   c. Measure capacity to the nearest liter and quart.
   d. Measure time to nearest minute.
   e. Identify days of the week, months.
   f. Make change up to $1.00.
   g. Measure mass to the nearest kilogram and pound.
   h. Identify items by the dozen.

6. Geometry

   a. Compare and contrast plane and solid geometric figures.
   b. Identify and construct geometric patterns.
   c. Identify symmetrical figures and their line(s) of symmetry.

7. Probability and Statistics

   a. Read and interpret given bar graphs.
   b. Collect, classify, record, and tally information.
   c. Find points on a rectangular coordinate plane using ordered pairs.

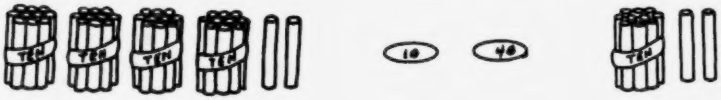
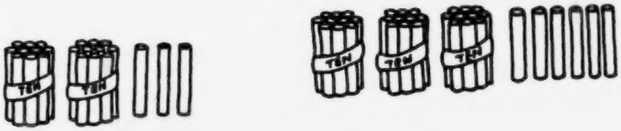
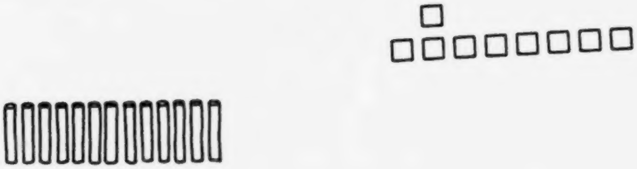
## MATHEMATICS

**Grade Level:** 2 **Skills/Subject Area:** Numeration

**COMPETENCY GOAL 1:** The learner will identify and use whole numbers up to 1000.

| Objectives | Measures | |
|---|---|---|
| 1.1 Recognize and write numerals greater than 100 but less than 1000. | 1.1.1 | Fill in missing numbers:<br>237, ___, 239; 467, ___, ___, 470;<br>___, 384, ___. |
| | 1.1.2 | What number is 100 less than each number given?<br>500, 760, 435, 201 |
| 1.2 Identify and use "ten more than, or ten less than..." | 1.2.1 | Show the number that is ten more than each given number on the hundred board. |
| | 1.2.2 | Write the number that is ten less than each given number. |
| 1.3 Order and compare numbers to 1000. | 1.3.1 | Make the largest number possible from four given numbers. |
| | 1.3.2 | Sequence numbers from greatest to smallest using a given set of cards. |
| 1.4 Use word names for numerals with up to three digits. | 1.4.1 | Match:<br>18 thirty-seven<br>11 eighteen<br>37 eleven |
| | 1.4.2 | Write the numeral for thirty-seven ___.<br>(a) 37 (b) 319 |
| 1.5 Skip count by 3's and 4's. | 1.5.1 | Arrange counters in groups of 3 and 4. Count. |
| | 1.5.2 | Tell the numbers that follow:<br>(a) 3, 6, ____, ____<br>(b) 12, 15, ____, ____<br>(c) 6, 10, ____, ____, 22<br>(d) 49, 53, ____, ____, 65 |

COMPETENCY GOAL 1: The learner will identify and use whole numbers, up to 1000.

| Competency Indicators | Competency Measures |
|---|---|
| 1.6 Round numbers to nearest ten. | 1.6.1 Match the numbers rounded to tens. Sequence the numerals.<br><br> <br>1.6.2 Write to the nearest ten. Sequence the numerals.<br><br> |
| 1.7 Estimate value of sets with up to 50 objects. | 1.7.1 Estimate how many from given set. Count.<br>1.7.2 Estimate. Count.<br> |
| 1.8 Write numbers with up to three digits using expanded notation. | 1.8.1 25 = ___ tens + ___ ones<br>275 = ___ hundreds + ___ tens + ___ ones<br>1.8.2 3 tens + 1 one = ___<br>4 hundreds + 0 tens + 3 ones = ___ |

MATHEMATICS

Grade Level: 2 Skills/Subject Area: Whole Numbers

COMPETENCY GOAL 2: The learner will be able to compute with whole numbers.

| Objectives | Measures |
|---|---|
| 2.1 Estimate, then add two-digit numbers with regrouping. | 2.1.1 $\begin{array}{r}14\\+19\\\hline\end{array}$ $\begin{array}{r}24\\+37\\\hline\end{array}$ |
| | 2.1.2 Write the correct answer.<br>$\begin{array}{r}37\\+18\\\hline\end{array}$<br>(a) less than 40<br>(b) about 60<br>(c) more than 60<br>(d) none of these |
| 2.2 Add two three-digit numbers with regrouping once. | 2.2.1 Add. Circle the right answer.<br>$\begin{array}{r}312\\+429\\\hline\end{array}$<br>(a) 7311<br>(b) 741<br>(c) 841<br>(d) 730 |
| | 2.2.2 Add. Write the correct answer.<br>$\begin{array}{r}219\\+849\\\hline\end{array}$ |
| 2.3 Check addition sums. | 2.3.1 Change the order of addends and add. Do the sums match? |
| | 2.3.2 Subtract the second addend from the sum to obtain the first addend. |
| 2.4 Estimate sums. | 2.4.1 Answer orally: Estimate the number of windows on two walls. |
| | 2.4.2 Given the numbers 232 and 428, estimate the sum. |
| 2.5 Check subtraction with addition. | 2.5.1 Check each subtraction problem.<br>$\begin{array}{r}57\\-18\\\hline\end{array}$ $\begin{array}{r}61\\-37\\\hline\end{array}$ |

COMPETENCY GOAL 2: The learner will be able to compute with whole numbers.

| Objectives | | Measures | |
|---|---|---|---|
| 2.6 | Subtract, using up to two three-digit numbers without regrouping. | 2.6.1 | Subtract.<br>495<br>-43 |
| | | 2.6.2 | Circle the right answer.<br>309<br>-202<br>(a) 107<br>(b) 507<br>(c) 511<br>(d) 197 |
| 2.7 | Find subtraction patterns. | 2.7.1 | Subtract:<br>(a) 15 -9<br>(b) 15 -8<br>(c) 15 -7<br>Do you see a pattern in the answer? |
| | | 2.7.2 | Subtract:<br>(a) 13 -6<br>(b) 13 -7<br>(c) 13 -8<br>Is there a pattern? |
| 2.8 | Use multiple arrays to group objects for counting. | 2.8.1 | Group a set of objects in multiples of two. |
| | | 2.8.2 | Group a set of 20 objects into equal groups. |
| 2.9 | Determine the total number of objects by repeated addition of groups of 2's, 3's, or 5's. | 2.9.1 | Group a specified number of objects into sets of 2,3,5, and count by 2's, 3's, 5's, for total. |
| | | 2.9.2 | Tally into groups of five and count by fives for total. |
| 2.10 | Divide a given figure into two, three, or four parts. | 2.10.1 | Divide paper into four parts to be used for four activities. |
| | | 2.10.2 | Draw lines dividing a figure into a given number of equal parts. |

Grade Level: 2 Skills/Subject Area: Fractions

**COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their uses.**

| Objectives | Measures |
|---|---|
| **3.1 Divide regions into halves, thirds, fourths, and tenths.** | **3.1.1 Identify a region that had been divided into give fractional parts.** |
| | **3.1.2 Draw a line to divide a region into a given number of fractional parts.** |
| **3.2 Divide sets into halves, thirds, and fourths.** | **3.2.1 Separate a set of manipulatives into specified fractional parts.** |
| | **3.2.2 Identify fractional parts into which the set has been divided.** |

**Grade Level:** 2 Skills/Subject Area: Decimals

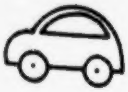
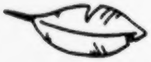
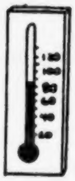
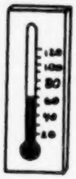
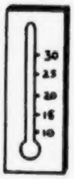
COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimal notation in money expressions.

| Objectives | Measures |
|---|---|
| 4.1 Write in decimal form money expressions of less than one dollar. | 4.1.1 Write in decimal form:<br>(a) 89¢ (b) 6¢<br>4.1.2 (a) How much is $ .47 in cents?<br>(b) How much is $ .96 in cents? |

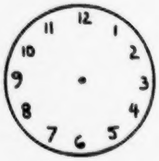
MATHEMATICS

Grade Level: 2 Skills/Subject Area: Measurement

COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.1 Measure length to the nearest centimeter/inch. | 5.1.1 Use a metric ruler to measure a given item to the nearest centimeter. |
| | 5.1.2 Collect sticks. Measure the longest and shortest to the nearest inch. By how many inches do they differ? |
| 5.2 Measure capacity to the nearest liter and quart. | 5.2.1 Compare the capacity of a liter to the capacity of a different size container. More or less? Same? |
| | 5.2.2 Determine the capacity of a larger container by emptying it into one or more liter containers. |
| 5.3 Measure mass to the nearest kilogram. | 5.3.1 Circle the object that has a mass of more than one kilogram.<br><br> |
| | 5.3.2 On a balance scale, compare a kilogram mass piece and assorted objects. Sequence least to greatest. |
| 5.4 Read both Celsius and Fahrenheit thermometers. | 5.4.1 Which has the highest temperature?<br><br> |
| | 5.4.2 Mark 15° C.<br><br> |

COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.5 Identify sets of one dozen items. | 5.5.1 Sort cartons into sets of dozens or other sets. |
| | 5.5.2 Identify items that are usually packaged by the dozen. Suggest reasons why. |
| 5.6 Measure time to the nearest five minute interval. | 5.6.1 Use a clock with a "second hand" to time an activity. |
| | 5.6.2 Draw the hands on a clock to show 2:15.<br><br> |
| 5.7 Use a calendar to identify days of the week, months. | 5.7.1 What day comes just after Monday? Sunday? Tuesday? Wednesday? |
| | 5.7.2 Sequence calendar pages. |
| 5.8 Estimate the duration of an event. | 5.8. Estimate the length of time it takes for simple tasks such as tying shoes, etc. Time the activity. |
| | 5.8.2 Compare the length of time it takes to complete several tasks. Determine which one takes the least and most amount of time. |
| 5.9 Solve simple time-related problems. | 5.9.1 Sue wakes up at 7:00 a.m. Her little sister wakes up at 9:00 a.m. Who wakes up earlier? |
| | 5.9.2 Individual assignment: Put the red card on the math table at 9:35 today. Turn in your spelling worksheet at 11:40. |

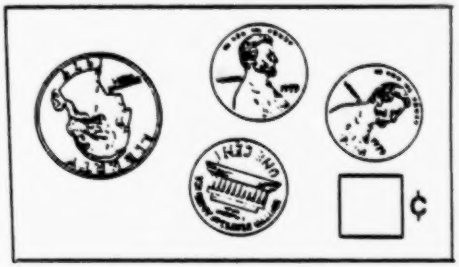
COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

**Objectives** **Measures**

5.10 Use all coins with value to $1.00.

5.10.1 Write the value, using ¢, of a given set of coins.

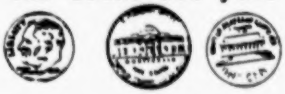
5.10.2 Solve:



5.11 Make change to $1.00.

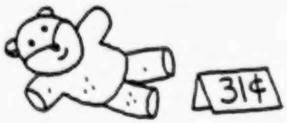
5.11.1 How much change back from 89¢?

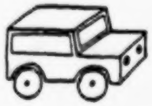
5.11.2 Circle the coins for your change.



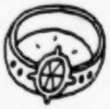
5.12 Compare the costs of several items and estimate the total cost of them.

5.12.1 You have 50¢. Circle the item or items you can buy.



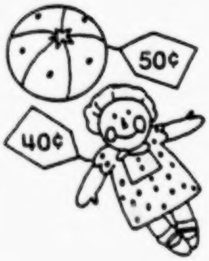


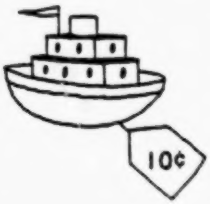
8¢

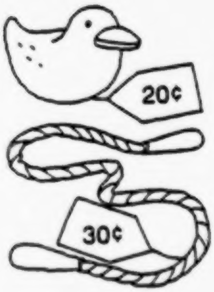


20¢

5.12.2 Which costs more? Circle your answer.







COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.13 Solve simple cost problems. | 5.13.1 Mary had 57¢. She bought an item for 25¢. How much does Mary have left? |
| | 5.13.2 Mary had 57¢ How much more is needed to buy a toy for 87¢? |

**Grade Level:** 2 **Skills/Subject Area:** Geometry

COMPETENCY GOAL 6: The learner will demonstrate an understanding and use of geometry.

| Objectives | Measures |
|---|---|
| 6.1 Compare and contrast plane and solid geometric figures. | 6.1.1 Match shapes to the given name.<br> |
| | 6.1.2 Find four spheres, three triangles, and seven rectangles in the classroom. |
| 6.2 Use simple geometric terms and names of figures in vocabulary. | 6.2.1 Name objects in classroom that are the same shape as the following: cube, sphere, cylinder, cone. Use vocabulary to describe each, e.g., "The paint container is a cylinder." |
| | 6.2.2 Question: "Is the pencil box a cube or a cylinder?" |
| 6.3 Identify and construct symmetric figures; show lines of symmetry. | 6.3.1 Given a symmetrical figure on a geoboard, copy it on dot paper. Draw its lines of symmetry. |
| | 6.3.2 Draw a symmetrical triangle. Cut it out and fold it to show its line(s) of symmetry. |
| 6.4 Extend a geometric pattern in more than one direction. | 6.4.1 Find the given block pattern and extend the pattern. |
| | 6.4.2 Repeat the block pattern backwards. |
| 6.5 Identify errors in a geometric pattern. | 6.5.1 Use pattern blocks to show a repeated pattern. Insert a shape to interrupt the pattern. |
| | 6.5.2 Circle the object(s) in a given geometric pattern which interrupt the pattern. |

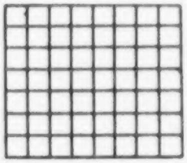
COMPETENCY GOAL 6: The learner will demonstrate an understanding and use of geometry.

| Objectives | | Measures | |
|---|---|---|---|
| 6.6 | Construct three-dimensional figures. | 6.6.1 | Given a set of Tinker Toys, etc., build a "long box," a cube, etc. |
| | | 6.6.2 | Construct a figure so that it is similar to, but larger than, the given one. |
| 6.7 | Identify geometric patterns and shapes in the real world. | 6.7.1 | Find geometric shapes in nature. |
| | | 6.7.2 | Find geometric shapes used in architecture, engineering, etc. |

# MATHEMATICS

Grade Level: 2 Skills/Subject Area: Probability & Statistics

COMPETENCY GOAL 7: The learner will demonstrate an understanding of probability and statistics.

| Objectives | | Measures |
|---|---|---|
| 7.1 Estimate the probable outcome of a survey. | 7.1.1 | Think about the likelihood of more or fewer boys than girls liking pepperoni pizza. |
| | 7.1.2 | Ask classmates' opinions concerning favorite pizza toppings. |
| 7.2 Sort and classify information. | 7.2.1 | Ask male and female classmates specific question about pepperoni pizza. Have classmates vote on favorite pizza toppings and collect ballots. |
| | 7.2.2 | Separate all boys who like pepperoni pizza from girls who do. Sort ballots into groups, e.g., sausage topping, pepperoni topping. |
| 7.3 Tally information. | 7.3.1 | Use tally marks to show each piece of information. |
| | 7.3.2 | Count all tally marks to obtain total count. |
| 7.4 Represent information. | 7.4.1 | Draw or attach symbols on a graph to represent gathered data regarding male and female preferences. |
| | 7.4.2 | Shade a bar graph to represent pizza topping data. |
| 7.5 Find points on a coordinate graph using ordered pairs. | 7.5.1 | Name a point, (e.g., 3,4) on a coordinate graph.<br> |
| | 7.5.2 | Given a specified point on a checkerboard, place counter or checker on point. |

## Grade 3 Outline

1. Numeration
   - a. Order and compare numbers up to 10,000.
   - b. Skip count by 100.
   - c. Write numbers of four digits or less in standard form using words and expanded notation.
   - d. Identify odd and even numbers up to 10,000.
   - e. Round to the nearest hundred.

2. Whole Numbers
   - a. Add two three-digit numbers with regrouping.
   - b. Subtract two two-digit numbers with regrouping.
   - c. Multiply one two-digit number by a one-digit number without regrouping.
   - d. Estimate the number of sets within a group.
   - e. Use the properties of zero and one in computation.

3. Fractions
   - a. Identify fractional parts of regions and sets that have been divided into as many as eight parts.
   - b. Use a number line to determine fractional parts--halves, thirds, fourths, . . . eighths.

4. Decimals
   - a. Read and write money equivalents.

5. Measurement
   - a. Use appropriate units of measure for length (in., cm, mm), capacity (qt., L), volume (cm), mass (g, kg, oz., lb.).
   - b. Order time sequences; distinguish between a.m. and p.m.; determine elapsed time.
   - c. Solve a variety of money-related problems involving making change.

6. Geometry
   - a. Identify properties of solid and plane figures.
   - b. Find lines of symmetry in various figures.
   - c. Draw diagonals of polygons.
   - d. Identify similar figures.
   - e. Determine edges, faces, vertices of various geometric solids.
   - f. Use ordered pairs on coordinate grids.

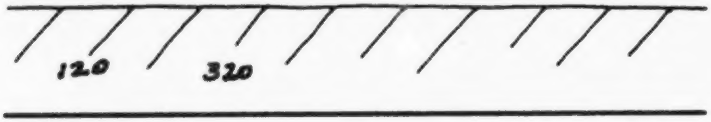
7. Probability and Statistics

    a. Read, interpret, and plot points on coordinate graphs.
    b. Sort information and estimate outcomes.

## MATHEMATICS

**Grade Level:** 3 **Skills/Subject Area:** Numeration

COMPETENCY GOAL 1: The learner will identify and use whole numbers up to 10,000.

| Objectives | Measures |
|---|---|
| 1.1 Order and compare numbers up to 10,000. | 1.1.1 Fill in the blanks:<br>(a) 231, 232, ___; (b) 3,964, ____, 3,966.<br>1.1.2 (a) Which is largest: 3,254 or 3,524?<br>(b) Which is smallest: 291 or 192? |
| 1.2 Round numbers to the nearest 100. | 1.2.1 Team A earned 340 points. Round 340 to the nearest hundred. __________.<br>Team B earned 374 points. Round 374 to the nearest hundred. __________.<br>1.2.2 Estimate the sum by rounding:<br>102<br>189<br>+495 (a) 600 (b) 800 (c) 700 |
| 1.3 Skip count by 100 up to 10,000. | 1.3.1 Fill in the number line by skip counting by 100.<br> <br>1.3.2 Give the next number when skip counting by 100:<br>(a) 237, 337, ___; (b) 8,374, ____, 8,574. |
| 1.4 Use odd and even numbers. | 1.4.1 Fill in the missing numbers in a given set of odd numbers.<br>1.4.2 Name the odd numbers from 0-20; 60-100. |
| 1.5 Write number up to four digits in standard form using expanded notation, and using words. | 1.5.1 Write:<br>(a) four tens, seven ones = ____<br>(b) 2,694 = ____thousands + ____hundreds + ____ tens + ____ones.<br>1.5.2 Write the number with the word name: six thousand four hundred twenty-three. |

COMPETENCY GOAL 1: The learner will identify and use whole numbers up to 10,000.

| Objectives | Measures |
|---|---|
| 1.6 Estimate the value of a set containing up to 100 objects. | 1.6.1 Given a set of counters, estimate the number in the set. Then count to verify estimate.<br>1.6.2 Estimate the number of tens in a given number such as 87. Group counters into sets of tens and ones and count. |

# MATHEMATICS

**Grade Level:** 3 **Skills/Subject Area:** Whole Numbers

**COMPETENCY GOAL 2:** The learner will be able to compute using whole numbers.

| Objectives | Measures |
|---|---|
| 2.1 Use the zero property of addition. | 2.1.1 Add: $\begin{array}{r}175\\+230\\\hline\end{array}$ $\begin{array}{r}142\\+30\\\hline\end{array}$ |
| | 2.1.2 Find the number of counters to add to 17 when wanting 17 counters in all. Name another situation when this occurs. |
| 2.2 Estimate the sum of two three-digit numbers. | 2.2.1 Estimate the sum. Add.<br>$\begin{array}{r}533\\+297\\\hline\end{array}$ |
| | 2.2.2 Use pictures or manipulatives to estimate the number of items shown, e.g., the number of counters on the table. Verify. |
| 2.3 Add two three-digit numbers with regrouping. | 2.3.1 Add: $\begin{array}{r}483\\+328\\\hline\end{array}$ |
| | 2.3.2 Answer: Ted's Grocery Store sold 375 boxes of cereal. The K & T Store sold 378 boxes. How many were sold in all? |
| 2.4 Subtract two two-digit numbers with regrouping. | 2.4.1 Subtract:<br>$\begin{array}{r}72\\-26\\\hline\end{array}$ |
| | 2.4.2 Answer: I have 23 buttons. I want 42 buttons. How many buttons do I need? |
| 2.5 Estimate differences between any two numbers with up to three digits. | 2.5.1 Estimate the difference. Verify your answer by subtracting.<br>$\begin{array}{r}593\\-210\\\hline\end{array}$ $\begin{array}{r}790\\-385\\\hline\end{array}$ |
| 2.6 Subtract money amounts. | 2.6.1 Answer: Amy had \$1.41. She spent fifty-two cents. How much money did she have left? |
| | 2.6.2 Subtract: $\begin{array}{r}\$9.25\\-\$6.48\\\hline\end{array}$ |

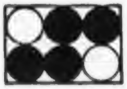
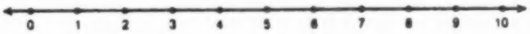
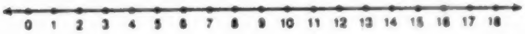
COMPETENCY GOAL 2: The learner will be able to compute using whole numbers.

| Objectives | Measures |
|---|---|
| 2.7 Use zero in subtraction. | 2.7.1 Answer: Hazel had 150 pieces of paper. She used 48 pieces. Write a subtraction problem and show how much paper Hazel had left. |
| | 2.7.2 Subtract: $\begin{array}{r}306\\ \underline{-145}\end{array}$ |
| 2.8 Multiply two one-digit numbers. | 2.8.1 Answer: Four dogs eat six hot dogs each. How many are eaten in all? |
| | 2.8.2 Multiply: 8 x 6 = ? |
| 2.9 Multiply a two-digit number by a one-digit number with no regrouping. | 2.9.1 Answer: A dozen boys have four baseball cards each. How many cards in all? |
| | 2.9.2 Multiply: $\begin{array}{r}23\\ \underline{x3}\end{array}$ |
| 2.10 Estimate products. | 2.10.1 Answer: Lou bought four boxes of rubber bands. Each box contained 48 bands. About how many rubber bands did Lou buy in all? |
| | 2.10.2 Estimate the product.<br>$\begin{array}{r}28\\ \underline{x3}\end{array}$ |
| 2.11 Multiply using one and zero as factors. | 2.11.1 Answer: (a) Each classmate has one spelling book. How many spelling books are in the room? (b) There are no German books for each of 29 third graders. Write an equation showing this information. |
| | 2.11.2 Multiply:<br>(a) 0 x 9 = ? (b) 9 x 1 = ? |
| 2.12 Estimate the number of sets within a group. | 2.12.1 Answer: Given a jar of jelly beans, estimate how many sets of three there are. Sort and count. |
| | 2.12.2 Answer: In a dozen chocolate doughnuts, estimate how many sets of three chocolate ones there are. |

MATHEMATICS

**Grade Level: 3** Skills/Subject Area: Fractions

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.1 Identify fractional parts of regions and sets that have been divided into as many as eight parts. | 3.1.1 Choose the correct fraction:<br><br>(a) $\frac{3}{4}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$<br>3.1.2 Divide the given region into fourths. Color $\frac{3}{4}$ of the region.<br> |
| 3.2 Identify fractional parts of number line segments. | 3.2.1 Divide the number line into fractional parts.<br>Name the fractional parts.<br><br> <br>3.2.2 Show $\frac{2}{3}$ of the number line.<br><br> |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.3 Divide a number line segment into specific fractional parts. | 3.3.1 Divide the number line segment into four equal parts. Identify three parts of the segment by a fractional name. |
| | 3.3.2 Cut the number line section into two fractional parts: $\frac{3}{4}$ and $\frac{1}{4}$ . |

Grade Level: 3 Skills/Subject Area: Decimals

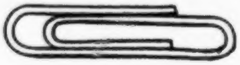
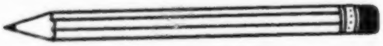
COMPETENCY GOAL 4: The learner will use decimals in reading and writing monetary expressions.

| Objectives | Measures |
|---|---|
| 4.1 Read and write given amount of money in decimal form. | 4.1.1 Write in decimal form, four dollars and twenty-one cents.<br>4.1.2 Match a column of money in written form, e.g., "two dollars, ten cents," to a column of money in decimal form, over $1.00. |
| 4.2 Compare money amounts written in decimal or word form. | 4.2.1 Answer: Which of the following is greater: Ten dollars, twenty-five cents, or $1.27?<br>4.2.2 Answer: Which is more: $2.08 or $2.80? |

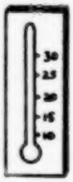
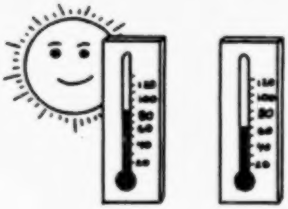
# MATHEMATICS

**Grade Level:** 3 **Skills/Subject Area:** Measurement

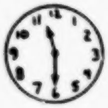
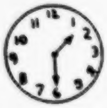
COMPETENCY GOAL 5: The learner will use and understand a variety of measurement concepts.

| Objectives | | Measures | |
|---|---|---|---|
| 5.1 | Estimate length to the nearest inch and centimeter. | 5.1.1 | (a) Estimate how many centimeters long the object is. Measure it.<br><br>(b) How many millimeters in 15 centimeters? |
| | | 5.1.2 | Estimate how many inches long the given object is. Measure it.<br> |
| 5.2 | Measure mass to the nearest gram. | 5.2.1 | Use a balance scale to find the mass of simple items, e.g., apples, crayons, and books. |
| | | 5.2.2 | Collect several similar items, e.g., rocks or apples. Arrange them according to size and estimate their mass. Then measure the mass of each. |
| 5.3 | Use capacity/volume terms in vocabulary. | 5.3.1 | Distinguish between volume and capacity. When would one use volume instead of capacity and vice versa? |
| | | 5.3.2 | Identify items purchased in liter containers, or whose capacity is expressed in liters. |
| 5.4 | Order containers by capacity/volume. | 5.4.1 | Pour liquid in several containers of different shapes and sizes. Compare and order the capacity of each from largest to smallest. |
| | | 5.4.2 | Pour rice from a large container into smaller containers. Order the containers from most volume to least volume. |

COMPETENCY GOAL 5: The learner will use and understand a variety of measurement concepts.

| Objectives | Measures |
|---|---|
| 5.5 Use a thermometer to measure temperature in degrees Celsius and Fahrenheit. | 5.5.1 Show 25° Celsius (or Fahrenheit).<br><br> <br>5.5.2 Give each temperature of recorded measurement.<br> |
| 5.6 Name years with numerals. | 5.6.1 Match:<br>(a) 1776 — nineteen hundred eighty-one<br>(b) 1981 — eighteen hundred fourteen<br>(c) 1814 — seventeen hundred seventy-six<br>5.6.2 Circle the correct year:<br>"fourteen hundred ninety-two"<br>(a) 1942 (b) 1492 (c) 1992 |
| 5.7 Use "a.m." and "p.m." in vocabulary. | 5.7.1 Answer: a.m. or p.m.? Circle.<br>(a) Three hours after midnight. a.m. p.m.<br>(b) Two hours after 11:00 p.m. a.m. p.m.<br>5.7.2 What time do you eat lunch, 12:30 a.m. or 12:30 p.m.? 12:30________. |

COMPETENCY GOAL 5: The learner will use and understand a variety of measurement concepts.

| Objectives | Measures |
|---|---|
| 5.8 Use alternate ways to write the same time. | 5.8.1 Match:<br>(a) 4:50 twenty-five minutes past 2 o'clock<br>(b) 6:45 ten minutes before five o'clock<br>(c) 2:25 quarter to seven<br>5.8.2 Write it another way:<br>(a) quarter till eight ____:____<br>(b) ten past seven (o'clock) ____:____<br>(c) twenty till nine (o'clock) ____:____ |
| 5.9 Estimate time lapse between two different times. | 5.9.1 Answer: About how much time does Jean have from<br> <br>about 2 hours about 3 hours about 1 hour<br>5.9.2 Answer: If Mario sleeps form 9:15 p.m. to 6:45 a.m., how many hours will he have slept?<br>(a) about 10 hours (b) about 15 hours<br>(c) about 3 hours |

COMPETENCY GOAL 5: The learner will use and understand a variety of measurement concepts.

| Objectives | Measures |
|---|---|

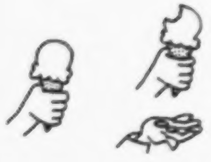
**5.10 Solve simple sequence problems.**

5.10.1 Match:

first

second

third



5.10.2 Fill in blanks from times given.
(a) Jennifer ate lunch at _______, had reading at _______, rode the bus home at _______, ate supper at _______, and went to bed at _______.

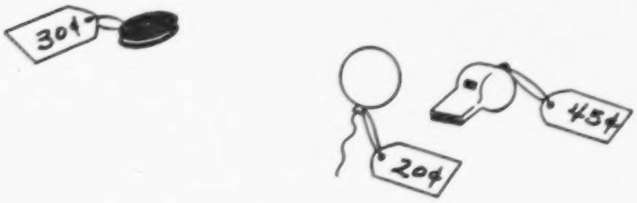
3:30 p.m. 9:30 p.m. 4:00 p.m.
11:30 p.m. 6:00 p.m. 1:30 p.m.

(b) Write: 3:30 p.m., etc.

**5.11 Estimate costs.**

5.11.1 Estimate the total cost of items in a given set.

5.11.2 From a picture showing a variety of items and their individual prices, estimate the differences in price of two or more of the items:



**5.12 Make all change.**

5.12.1 Answer: Bob got 67¢ back in change. How many pennies, nickels, dimes, and quarters did he receive?

5.12.2 Answer: Louis received 52¢ in change. Name (or show) the six coins he received.

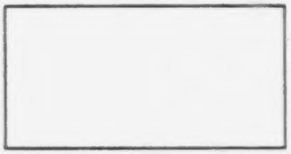
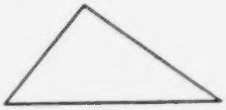
COMPETENCY GOAL 5: The learner will use and understand a variety of measurement concepts.

| Objectives | Measures |
|---|---|
| 5.13 Solve problems involving money. | 5.13.1 Answer: Kathy has $8.00. She needs to buy a lunch for $3.50. How much money will she have left? |
| | 5.13.2 Answer: David earned $1.00. He bought a pencil for 5¢, a notebook for 47¢, and an eraser for 18¢. How much change will he get back? |

# MATHEMATICS

Grade Level: 3 Skills/Subject Area: Geometry

COMPETENCY GOAL 6: The learner will understand and use two- and three-dimensional geometric concepts.

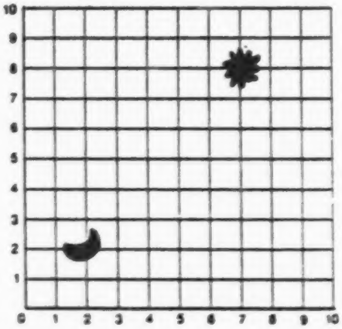
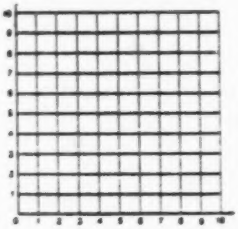
| Objectives | Measures |
|---|---|
| 6.1 Identify point, line, and line segment. | 6.1.1 Draw a line segment from point A to point B. |
| | 6.1.2 Make a drawing to show the difference in a line and a line segment. |
| 6.2 Identify right angles. | 6.2.1 Sort all of the pattern blocks. Classify the blocks according to angles. |
| | 6.2.2 Use a geoboard to construct a figure that has two right angles. |
| 6.3 Identify solid figures with flat or curved surfaces. | 6.3.1 (a) Find a solid figure that has flat surfaces.<br>(b) Find a solid figure with at least one curved surface. |
| | 6.3.2 Determine the number of flat surfaces on a (a) cube (b) paint can. |
| 6.4 Draw simple figures such as triangles, squares, rectangles. | 6.4.1 Given a description of a geometric figure, draw the figure. |
| | 6.4.2 From a given geometric figure, give a description for it. |
| 6.5 Draw diagonals for various plane geometric figures. | 6.5.1 Draw two diagonals in this figure:  |
| | 6.5.2 Answer: How many diagonals can be drawn in this figure?  |

COMPETENCY GOAL 6: The learner will understand and use two- and three-dimensional geometric concepts.

| Objectives | Measures |
|---|---|
| 6.6 Identify and draw lines of symmetry for given plane geometric figures. | 6.6.1 Make a given figure symmetrical if it is not.<br>6.6.2 Search and find pictures of symmetrical figures. Draw their line(s) of symmetry. |
| 6.7 Identify geometric attributes of given two- and three-dimensional figures. | 6.7.1 Given a set of blocks, find all those which possess one or more right angles.<br>6.7.2 Find the blocks in the set that do not have six sides. |
| 6.8 Use number pairs to locate points on a grid. | 6.8.1 Given a grid with items located on it, identify the item whose location is described by a given pair of numbers.<br>6.8.2 Describe the location of a specified item on a grid using a number pair. |
| 6.9 Use side, point, angle, center of circle, and symmetry in vocabulary. | 6.9.1 Answer the riddle: I am formed when two line segments meet. What am I? ________.<br>6.9.2 Describe: How is a point different from an angle? |
| 6.10 Count edges, vertices, and faces on solids. | 6.10.1 Answer: How many faces are on a cube? How many edges?<br>6.10.2 Answer: How many corners (vertices) are on a rectangular solid? |
| 6.11 Identify and use similar figures. | 6.11.1 Construct another shape, using the same four sides as the given shape. What is different? What is the same?<br>6.11.2 Use a geoboard to construct a triangle similar to, but larger than, the given one. |

**Grade Level:** 3 **Skills/Subject Area:** Probability & Statistics

COMPETENCY GOAL 7: The learner will demonstrate an understanding and use of probability and statistics.

| Objectives | Measures |
|---|---|
| 7.1 Read, interpret, and plot points on coordinate graphs. | 7.1.1 On a coordinate graph, locate the star, space ship, sun, moon, etc. Name the coordinates.  <br> 7.1.2 On the "Neighborhood" coordinate graph, find the house located at (1,7). Draw it. Find the post office at (7,1), etc.  |
| 7.2 Estimate probable outcomes from sorting information. | 7.2.1 There are 50 crayons in the box. There are six different colors. Estimate which ones will be used the least and the most in a given coloring activity. Verify. <br> 7.2.2 Collect an assortment of coins from your classmates. Estimate how many of each you have. |

## GRADES 4-6

### Major Emphases

In grades 4-6, there is a continuation of the major emphases initiated in grades K-3 as the learner moves to the "skill establishment" stage. Activities, exploration, and experimentation include provisions for:

- translating ideas into mathematical language and symbols.
- learning to make reasonable estimates.
- developing independence in solving meaningful problems.
- mastering basic number facts.
- computing with whole numbers, fractions, and decimals.
- learning geometric concepts.
- developing measurement skills.
- constructing and interpreting tables, charts, and graphs.
- examining notions of elementary probability and statistics.

The mathematics program at grades 4-6 should be enriched and enhanced through the use of calculators and computers.

## Grade 4 Outline

1. Numeration
    - a. Compare two numbers up to six digits.
    - b. Round numbers to nearest ten, hundred or thousand.
    - c. Change numbers less than one million from standard form to word form and vice versa.
    - d. Give place value of a digit in a number less than one million.
2. Whole Numbers
    - a. Add and subtract three-digit numbers with regrouping.
    - b. Multiply two two-digit numbers with regrouping.
    - c. Divide a three-digit number by a one-digit number with regrouping and a remainder.
    - d. Estimate sums, differences, and products by rounding.
    - e. Solve problems.
3. Fractions
    - a. Identify equivalent fractions.
    - b. Add and subtract fractions with like denominators.
    - c. Change fractions to mixed numbers and vice versa.
    - d. Write a fraction in lowest terms.
    - e. Multiply a whole number by a fraction.
4. Decimals
    - a. Identify the value of a given decimal.
    - b. Order money amounts written as decimals.
    - c. Solve problems.
5. Measurement
    - a. Express time in hours and minutes using addition and subtraction.
    - b. Determine length, width, or height of an object to nearest centimeter or ½ inch.
    - c. Identify relationship between inch/foot, centimeter/meter, ounce/pound.
    - d. Solve problems.
6. Geometry
    - a. Identify points, segments, rays, lines, angles, and right angles.
    - b. Identify congruent figures.
    - c. Recognize the radius and diameter of a circle.

d. Find the perimeter of a given geometric figure.
e. Find the area of a given geometric figure.
f. Sort objects using two attributes.
g. Repeat a geometric pattern in reverse.

7. Probability and Statistics

a. Determine and tally the frequency of events.

## MATHEMATICS

Grade Level: 4 Skills/Subject Area: Numeration

COMPETENCY GOAL 1: The learner will demonstrate an understanding of numeration.

| Objectives | Measures |
|---|---|
| 1.1 Change numbers less than one million from word form to standard form. | 1.1.1 Seven hundred forty thousand, six hundred fifty-two is written:<br>(a) 714,652<br>(b) 740,652<br>(c) 744,652<br>(d) 740,662 |
| | 1.1.2 Five hundred ninety-three thousand, eight hundred forty-six is written: ________________. |
| 1.2 Change numbers less than one million from standard form to word form. | 1.2.1 412,605 is read:<br>(a) four hundred twelve thousand, six hundred fifty<br>(b) four hundred twenty thousand, six hundred five<br>(c) four hundred twelve thousand, sixty-five<br>(d) four hundred twelve thousand, six hundred five |
| | 1.2.2 57,693 written in word form is ____________ ________________________________________. |
| 1.3 Give place value of a digit in a number less than one million. | 1.3.1 What is the place value of 7 in 873,219?<br>(a) thousands<br>(b) hundred thousands<br>(c) ten thousands<br>(d) millions |
| | 1.3.2 The place value of 3 in 381,567 is _______ ____________________. |
| | 1.3.3 Use a calculator to display a given number. What is in the thousands place? |

Skills/Subject Area: Numeration

COMPETENCY GOAL 1: The learner will demonstrate an understanding of numeration.

| Objectives | | Measures |
|---|---|---|
| 1.4 Round numbers to the nearest ten, hundred, or thousand. | 1.4.1 | 5,693 rounded to the nearest thousand is<br>(a) 6,000<br>(b) 5,000<br>(c) 10,000<br>(d) 1,000 |
| | 1.4.2 | 819 rounded to the nearest hundred is _____. |
| 1.5 Compare two numbers up to six digits using "greater than," "less than," or "equal to" symbols. | 1.5.1 | Which symbol belongs in the space between the two numbers below ( >, < , =)?<br>512,235     521,235<br>(a) ><br>(b) <<br>(c) =<br>(d) >or< |
| | 1.5.2 | Which symbol belongs in the space between the pairs of numbers below ( >, < , = )?<br>(a) 685,923     685,932<br>(b) 825,765     852,765 |

## MATHEMATICS

**Grade Level: 4** **Skills/Subject Area:** Whole Numbers

**COMPETENCY GOAL 2: The learner will demonstrate ability and skill in computation of whole numbers.**

| Objectives | Measures |
|---|---|
| **2.1 Recall basic addition and subtraction facts with reasonable promptness.** | **2.1.1 Give answers to basic facts given during a timed interval such as ten facts in 30 seconds.** |
| | **2.1.2 Give possible addends of a sum during a timed interval.** |
| **2.2 Apply the order and grouping properties of addition.** | 2.2.1 Complete: 5 + 8 = _____ + 5<br>(a) 7<br>(b) 5<br>(c) 13<br>(d) 8 |
| | 2.2.2 Complete: (4 + 2) + 5 = 4 + (2 + _____). |
| **2.3 Mentally add three, four, and five single digit addends.** | 2.3.1 6 + 8 + 9 + 2 + 3 =<br>(a) 25<br>(b) 26<br>(c) 27<br>(d) 28 |
| | 2.3.2 Add:<br>(a) $\begin{array}{r}4\\6\\+8\\\hline\end{array}$ (b) $\begin{array}{r}7\\3\\6\\+9\\\hline\end{array}$ (c) $\begin{array}{r}4\\3\\6\\7\\+7\\\hline\end{array}$ |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| **2.4 Use subtraction to find the missing addend.** | 2.4.1 Find the missing addend:<br>9 + _____ = 16<br>(a) 5<br>(b) 6<br>(c) 7<br>(d) 25 |
| | 2.4.2 Find the missing addend:<br>(a) 6 + ____ = 15     (c) ____ + 6 = 11<br>(b) 8 + ____ = 17     (d) ____ + 7 = 16 |
| **2.5 Add up to four-digit numbers with regrouping.** | 2.5.1 Add:<br>476<br>+237<br>(a) 713<br>(b) 613<br>(c) 703<br>(d) 603 |
| | 2.5.2 Add:<br>736 / +79     68 / +94     426 / +937 |
| **2.6 Estimate sums by rounding to the nearest ten, hundred, or thousand.** | 2.6.1 To best estimate 512 + 496, you would add<br>(a) 500 + 500<br>(b) 500 + 400<br>(c) 600 + 400<br>(d) 600 + 500 |
| | 2.6.2 Estimate the answer. Then use a calculator to compute.<br>39<br>21<br>+67 |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| **2.7 Estimate differences by rounding to the nearest ten, hundred, or thousand.** | **2.7.1 To best estimate 719 - 396, you would subtract:**<br>**(a) 400 from 800**<br>**(b) 400 from 700**<br>**(c) 300 from 800**<br>**(d) 300 from 700**<br>**2.7.2 Estimate the answer. Then compute.**<br>429<br>- 97 |
| **2.8 Give reasonably prompt responses to all basic multiplication facts.** | **2.8.1 Give the products of one-digit by one-digit numbers during a timed interval.**<br>**2.8.2 Give two factors for the product stated during a timed interval.** |
| **2.9 Understand multiples and common multiples of numbers.** | **2.9.1 Answer: Which are common multiples of 2 and 3?**<br>(a) 0, 6, 12, 18, 24<br>(b) 0, 2, 3, 6, 12<br>(c) 1, 2, 3, 6, 12<br>(d) 2, 3, 6, 9, 12<br>**2.9.2 Give the first 10 multiples of 4.** |
| **2.10 Find the missing factor in a basic multiplication fact.** | 2.10.1 Complete:<br>7 x ___ = 56<br>(a) 5<br>(b) 6<br>(c) 7<br>(d) 8<br>2.10.2 Complete:<br>(a) ___ x 6 = 48<br>(b) 9 x ___ = 72 |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| 2.11 Multiply a two- , three- , or four-digit number by a one-digit number with regrouping. | 2.11.1 Multiply:<br>426<br>x3<br>(a) 769<br>(b) 1278<br>(c) 1268<br>(d) 1269<br>2.11.2 Multiply:<br>(a) 37<br>x2<br>(b) 653<br>x4 |
| 2.12 Estimate the product of two numbers by rounding factors to nearest tens or hundreds. | 2.12.1 To best estimate 46 x 98, you would multiply<br>(a) 50 x 90<br>(b) 40 x 90<br>(c) 50 x 100<br>(d) 40 x 100<br>2.12.2 Estimate the product. Then compute.<br>47<br>x19 |
| 2.13 Multiply two 2-digit numbers. | 2.13.1 Multiply:<br>43<br>x36<br>(a) 1218<br>(b) 1296<br>(c) 1448<br>(d) 1548<br>2.13.2 Multiply:<br>(a) 43<br>x15<br>(b) 89<br>x76 |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| 2.14 Learn basic division facts. | 2.14.1 Divide:<br>28 ÷ 4<br>(a) 6<br>(b) 7<br>(c) 8<br>(d) 9<br>2.14.2 Divide:<br>(a) 48 ÷ 6 (c) 6 ÷ 54<br>(b) 81 ÷ 9 (d) 7 ÷ 42 |
| 2.15 Solve basic division equations with a remainder. | 2.15.1 Divide:<br>$5\overline{)49}$<br>(a) 8 R 4<br>(b) 9 R 4<br>(c) 9 R 5<br>(d) 10 R 1<br>2.15.2 Divide:<br>(a) $8\overline{)35}$ (b) $6\overline{)35}$ (c) $4\overline{)19}$ |
| 2.16 Divide a two- or three-digit number by a one-digit number with no regrouping. | 2.16.1 Divide:<br>$4\overline{)840}$<br>(a) 110<br>(b) 120<br>(c) 210<br>(d) 220<br>2.16.2 Divide:<br>(a) $3\overline{)93}$ (b) $3\overline{)639}$ |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| **2.17 Divide a two-digit number by a one-digit number with regrouping.** | **2.17.1 Divide:**<br>$2\overline{)32}$<br>(a) 11<br>(b) 12<br>(c) 14<br>(d) 16<br>**2.17.2 Divide:**<br>(a) $4\overline{)96}$ (b) $3\overline{)513}$ |
| **2.18 Check division by multiplying.** | **2.18.1 To check 426 ÷ 3 = 142, you would**<br>(a) add 3 and 142<br>(b) multiply 426 by 3<br>(c) multiply 142 by 3<br>(d) divide 142 by 3<br>**2.18.2 Check the problems below:**<br>(a) $\begin{array}{r}191\\4\overline{)764}\end{array}$ (b) $\begin{array}{r}61\\5\overline{)305}\end{array}$ |
| **2.19 Divide a three-digit number by a one-digit number with regrouping and a remainder. Use a calculator to check.** | **2.19.1 Divide:**<br>$4\overline{)306}$<br>(a) 76 R 2<br>(b) 77 R 3<br>(c) 86 R 2<br>(d) 87 R 3<br>**2.19.2 Divide:**<br>(a) $5\overline{)603}$ (b) $3\overline{)685}$ |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| 2.20 Solve story problems using whole number computation. | 2.20.1 John worked eight hours a day for six days. How many hours did he work in all?<br>(a) 14<br>(b) 40<br>(c) 48<br>(d) 49 |
| | 2.20.2 Julie bought 24 tulip bulbs. She put four bulbs in each row. How many rows did she plant? |
| 2.21 Find the factors of a given number. | 2.21.1 The factors of 12 are:<br>(a) 2, 3, 4, 6,<br>(b) 1, 2, 6, 12<br>(c) 1, 3, 4<br>(d) 1, 2, 3, 4, 6, 12 |
| | 2.21.2 The factors of 25 are __________. |
| 2.22 Find the common factors of two numbers. | 2.22.1 The common factors of 12 and 18 are:<br>(a) 1, 2, 3, 6<br>(b) 1, 12, 18<br>(c) 2, 3, 6<br>(d) 1, 6, 12 |
| | 2.22.2 Find the common factors of 6 and 8. |

# MATHEMATICS

**Grade Level: 4** Skills/Subject Area: Fractions

**COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.**

| Objectives | Measures |
|---|---|
| **3.1 Identify equivalent fractions using shaded regions or pictures of sets.** | 3.1.1 What two fractions tell what part of the set has been shaded?<br>(a) $\frac{5}{10}$ or $\frac{1}{2}$ (b) $\frac{4}{10}$ or $\frac{2}{5}$<br>(c) $\frac{6}{10}$ or $\frac{3}{5}$ (d) $\frac{5}{10}$ or $\frac{2}{5}$<br>3.1.2 Give two fractions telling what part is shaded. |
| 3.2 Write a fraction that is equivalent to a given fraction. | 3.2.1 Which fraction is equivalent to $\frac{3}{4}$ ?<br>(a) $\frac{6}{12}$ (b) $\frac{12}{24}$<br>(c) $\frac{6}{8}$ (d) $\frac{1}{4}$<br>3.2.2 Complete:<br>(a) $\frac{2}{3} = \frac{\quad}{9}$ (b) $\frac{3}{4} = \frac{\quad}{8}$<br>(c) $\frac{3}{5} = \frac{\quad}{10}$ (d) $\frac{5}{8} = \frac{\quad}{16}$ |

COMPETENCY GOAL 3: The learner wil demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.3 Express a fraction in lowest terms. | 3.3.1 Express in lowest terms:<br>(a) $\frac{4}{16}$ (b) $\frac{5}{10}$ (c) $\frac{4}{16}$ (d) $\frac{3}{9}$<br>3.3.2 Which fraction shows $\frac{6}{24}$ in lowest terms?<br>(a) $\frac{1}{2}$ (b) $\frac{1}{3}$<br>(c) $\frac{6}{24}$ (d) $\frac{1}{6}$ |
| 3.4 Add or subtract fractions that have like denominators. | 3.4.1 Subtract:<br>$\begin{array}{r} \frac{4}{9} \\ -\ \frac{2}{9} \\ \hline \end{array}$ (a) $\frac{1}{3}$ (b) $\frac{3}{6}$ (c) $\frac{2}{9}$ (d) $\frac{1}{9}$<br>3.4.2 Compute:<br>$\begin{array}{r} \frac{2}{3} \\ +\ \frac{1}{3} \\ \hline \end{array}$ |

COMPETENCY GOAL 3: The learner wil demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.5 Change fractions to mixed numbers and mixed numbers to fractions. | 3.5.1 $\frac{7}{3}$ is equivalent to:<br>(a) $3\frac{1}{3}$ (c) 21<br>(b) $2\frac{1}{3}$ (d) $4\frac{1}{3}$<br>3.5.2 Write $4\frac{1}{2}$ as a fraction. |

# MATHEMATICS

Grade Level: 4 Skills/Subject Area: Decimals

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.1 Order money amounts written in decimal form from smallest to largest. | 4.1.1 Place in order:<br>$.68 $1.68 $.86 $.08<br>4.1.2 Choose the larger amount:<br>(a) $2.37, $2.73<br>(b) $4.08, $4.80 |
| 4.2 Read or write word names for money amounts. | 4.2.1 The amount, $4.84, written in words is:<br>(a) four dollars, eighty-four cents<br>(b) eighty-four cents<br>(c) four dollars, four cents<br>4.2.2 Write the word name for $3.85. |
| 4.3 Add or subtract given money amounts using the calculator. | 4.3.1 Add: 84¢, 79¢, 2¢, 3¢.<br>4.3.2 Add: $1.28, 29¢, $3.49, five dollars, eight cents; then subtract the sum from $15.89. |
| 4.4 Read and write decimals in tenths and hundredths. | 4.4.1 Write two and three tenths in decimal form.<br>(a) 2.1<br>(b) 1.2<br>(c) 2.3<br>(d) 2.03<br>4.4.2 Read these decimals.<br>(a) 3.6 (b) 4.8 (c) 18.62 |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.5 Write decimals in tenths and hundredths. | 4.5.1 Which digit is in the tenths place in the number, 853.23?<br>(a) 5<br>(b) 3<br>(c) 2<br>(d) 6 |
| | 4.5.2 Write a decimal with four in the tenths place and five in the ones place. |
| 4.6 Compare decimals. | 4.6.1 Which is larger, .3 or .7? |
| | 4.6.2 Which is larger, 3.35 or 3.4? |
| 4.7 Add decimals. | 4.7.1 Add: 3.5 + 2.7<br>(a) 6.2<br>(b) 5.2<br>(c) 62<br>(d) 52 |
| | 4.7.2 Add 6.48 and 7.49. |
| 4.8 Subtract decimals. | 4.8.1 Subtract: 7.4 - 6.1<br>(a) 1.3<br>(b) 13<br>(c) 130<br>(d) 1.03 |
| | 4.8.2 Subtract: 43.1 - 27.6 |

MATHEMATICS

Grade Level: 4 Skills/Subject Area: Measurement

COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.1 Use addition and subtraction to determine a time after or before a given time. | 5.1.1 What time is 20 minutes earlier than 11:12?<br>(a) 9:52<br>(b) 10:52<br>(c) 11:32<br>(d) 11:52 |
| | 5.1.2 How many minutes from 4:25 to 5:05? _______. |
| 5.2 Determine length, width, or height by measuring an object or a drawing to the nearest centimeter or one-fourth inch. | 5.2.1 Measure the bar to the nearest centimeter.<br>(a) 3cm<br>(b) 4cm<br>(c) 5cm<br>(d) 6cm<br> |
| | 5.2.2 What is the length of this bar to the nearest one-fourth inch? |
| 5.3 Identify relationships between inches and feet, centimeters and meters, yards and miles. | 5.3.1 The best unit to measure the distance between two cities is:<br>(a) the inch<br>(b) the foot<br>(c) the yard<br>(d) the mile |
| | 5.3.2 Tell which unit (inch, foot, mile) you would use to measure these lengths:<br>(a) length of the classroom_________<br>(b) width of your math book_________. |
| 5.4 Identify relationships between ounces and pounds; grams and kilograms. | 5.4.1 What is the best metric unit to use when finding the mass of a bar of candy?<br>(a) milligram<br>(b) gram<br>(c) kilogram<br>(d) ounce |
| | 5.4.2 Which is heavier? 800g or 1 kg. |

COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| **5.5 Identify relationships between cups, pints, quarts, and gallons as well as milliliters and liters.** | **5.5.1 Which unit would be used to measure the amount of water in an aquarium?**<br>(a) milliliter<br>(b) millimeter<br>(c) liter<br>(d) centimeter |
| | **5.5.2 Which unit will be used to measure the amount of gasoline a tank holds?**<br>(a) quart<br>(b) cup<br>(c) gallon<br>(d) pint |

# MATHEMATICS

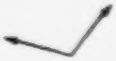
Grade Level: 4 Skills/Subject Area: Geometry

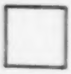
COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.

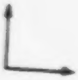
Competency Indicators | Competency Measures

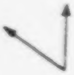
**6.1 Identify points, segments, rays, lines, angles, and right angles.**

6.1.1 Which shows a right angle?

a.


c.


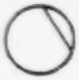
b.


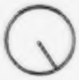
d.


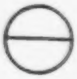
6.1.2 Draw a line segment.

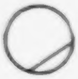
**6.2 Recognize radius and diameter of a circle.**

6.2.1 Which shows one diameter of a circle?

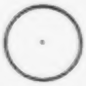
a.


c.


b.


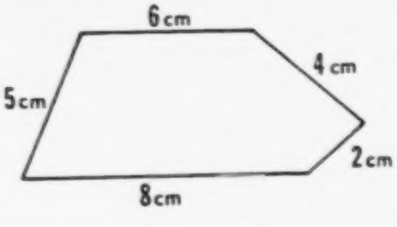
d.


6.2.2 Draw one radius for this circle.



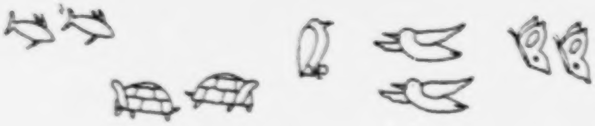
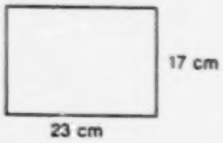
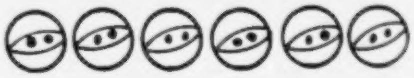
**6.3 Find the perimeter of a given figure.**

6.3.1 Give the perimeter of:



6.3.2 Draw a figure with the perimeter of 24cm.

COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.

| Objectives | Measures |
|---|---|
| 6.4 Sort objects using two attributes of likenesses; two attributes of differences. | 6.4.1 Sort the pattern blocks by angles and sides. Tell how they are different. |
| | 6.4.2 From the set of given objects, tell four ways that they could be sorted.<br> |
| 6.5 Find the area of a given figure. | 6.5.1 Give the area:<br><br> |
| | 6.5.2 Draw two figures that have the area of 20 square inches. |
| 6.6 Repeat a given pattern in reverse. | 6.6.1 Draw the figure that comes last when reversing the pattern.<br> |
| | 6.6.2 Give the figure that comes next when reversing the pattern.<br>△ ○ □ ✱ ✱ □ ○ |

**Grade Level:** 4 **Skills/Subject Area:** Probability & Statistics

**COMPETENCY GOAL 7: The learner will demonstrate an understanding of graphs, tables, and simple statistics.**

| Objectives | Measures |
|---|---|
| **7.1 Determine the frequency of events and tally.** | **7.1.1 Estimate, and then verify the number of heads rolled when tossing a coin 50 times.** |
| | **7.1.2 Estimate, and then verify the number of students who did not ride the bus this week.** |

## Grade 5 Outline

1. Numeration

    a. Compare numbers up to seven digits.
    b. Round numbers to nearest million.
    c. Change numbers less than one billion from word form to standard form and vice versa.
    d. Give place value of a digit in a number less than one billion.
    e. Write expanded numerals for numbers to millions.
    f. Recognize Roman numerals up to M.
    g. Determine whether a given number is prime or composite.

2. Whole Numbers

    a. Add two four-digit numbers with regrouping.
    b. Subtract two three-digit numbers with regrouping.
    c. Multiply two three-digit numbers with regrouping.
    d. Divide up to a five-digit number by a two-digit number.
    e. Find least common multiples and greatest common factors.
    f. Estimate sums, differences, products, and quotients by rounding.
    g. Solve problems.

3. Fractions

    a. Write fractions in lowest terms.
    b. Compare fractions.
    c. Change improper fractions to mixed numbers and vice versa.
    d. Add and subtract fractions and mixed numbers with unlike denominators.
    e. Multiply fractions.
    f. Divide a whole number by a fraction.
    g. Solve problems.

4. Decimals

    a. Compare decimal expressions up to thousandths.
    b. Give the place value for any digit in a decimal numeral through thousandths.
    c. Add and subtract decimal numbers with up to three decimal places.
    d. Multiply and divide decimals with up to three decimal places.

5. Measurement

    a. Name periods of time using day, hour, minute, second.
    b. Measure length using metric units (millimeter, centimeter, meter, and kilometer).
    c. Measure length using customary units (inch, foot, yard, mile).

- d. Measure temperature in Celsius and Fahrenheit degrees.
- e. Find areas of rectangles by counting and computing.
- f. Measure angles using a protractor.
- g. Solve problems.

6. Geometry

- a. Identify angles as acute, right, or obtuse.
- b. Identify parallel and perpendicular lines.
- c. Identify congruent figures and their corresponding parts.
- d. Recognize special triangles (equilateral, isosceles, scalene) and quadrilaterals (parallelogram, rhombus, trapezoid).
- e. Construct a circle with a compass and name the parts (radius, diameter).
- f. Estimate the perimeter of a given figure.
- g. Determine if a given figure is symmetrical.

7. Probability and Statistics

- a. Gather information, construct, and interpret bar, line, and circle graphs.
- b. Determine simple ratios.

## MATHEMATICS

Grade Level: 5 Skills/Subject Area: Numeration

COMPETENCY GOAL 1: The learner will demonstrate an understanding of numeration.

| Objectives | Measures |
|---|---|
| 1.1 Change numbers less than one billion from word form to standard form. | 1.1.1 Answer: Nine million, seven hundred seventeen thousand, two hundred thirty-one is written:<br>(a) 9,770,231<br>(b) 9,707,231<br>(c) 9,717,321<br>(d) 9,717,231<br>1.1.2 Answer: Sixty-eight million, four hundred twelve thousand, one hundred seven is written ____________________. |
| 1.2 Change numbers less than one billion from standard form to word form. | 1.2.1 Answer: 78,531,609 is read:<br>(a) seventy-eight million, five hundred thirty-one thousand, six hundred ninety<br>(b) seventy-eight million, five hundred thirty-one thousand, six hundred nineteen<br>(c) seventy-eight million, five hundred thirty-one thousand, six hundred nine<br>(d) seventy-eight million, five hundred thirty-one thousand, six hundred ninety-nine<br>1.2.2 Answer: Write 84,386,892 in word form. |
| 1.3 Give the place value of a digit in a number less than one billion. | 1.3.1 What is the place value of 6 in 765,498,301?<br>(a) hundred thousands<br>(b) millions<br>(c) ten millions<br>(d) ten thousands<br>1.3.2 Answer: The place value of 9 in 954,687,412 is ____________________. |
| 1.4 Write expanded numerals for numbers named with standard numerals to millions. | 1.4.1 Answer: 157,856 in expanded form is:<br>(a) 100,000 + 50,000 + 7,000 + 800 + 5 + 6<br>(b) 100,000 + 50,000 + 8,000 + 700 + 50 + 6<br>(c) 100,000 + 5,000 + 7,000 + 800 + 50 + 6<br>(d) 100,000 + 50,000 + 7,000 + 800 + 50 + 6<br>1.4.2 Write 79,801 in expanded form. |

Skills/Subject Area: Numeration

COMPETENCY GOAL 1: The learner will demonstrate an understanding of numeration.

| Competency Indicators | Competency Measures |
|---|---|
| 1.5 Round numbers to an indicated place, up through thousands. | 1.5.1 Answer: 546,827 rounded to the nearest thousand is:<br>(a) 546,000<br>(b) 600,000<br>(c) 545,000<br>(d) 547,000<br>1.5.2 Round 72,956 to the nearest ten thousand. |
| 1.6 Compare two numbers up to seven digits with "greater than", "less than", or "equal to" symbols. | 1.6.1 Answer: Which symbol belongs in the box?<br>6,783,512 ☐ 6,783,501<br>(a) ><br>(b) <<br>(c) =<br>(d) >or<<br>1.6.2 Compare using >, <, or =.<br>7,856,720 ☐ 7,865,270 |
| 1.7 Recognize and convert Roman numerals up to M to Hindu Arabic numerals. | 1.7.1 Answer: The Roman numeral XVII represents ________________.<br>(a) 4<br>(b) 13<br>(c) 15<br>(d) 17<br>1.7.2 Write the number each Roman numeral represents:<br>(a) X ________ (d) L ________ (f) M ________<br>(b) V ________ (e) C ________ (g) XXIX ________<br>(c) D ________ |

MATHEMATICS

Grade Level: 5 Skills/Subject Area: Whole Numbers

COMPETENCY GOAL 2: The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures | |
|---|---|---|
| 2.1 Add two or three four-digit numbers with regrouping. | 2.1.1 Add:<br>5463<br>7832<br>+3641 | (a) 15,936<br>(b) 16,834<br>(c) 15,832<br>(d) 16,936 |
| | 2.1.2 Add:<br>9471<br>8632<br>+1791 | |
| 2.2 Subtract two three-digit numbers with one regrouping. | 2.2.1 Subtract:<br>872<br>-395 | (a) 577<br>(b) 527<br>(c) 523<br>(d) 477 |
| | 2.2.2 Subtract:<br>604<br>-109 | |
| 2.3 Estimate differences by rounding to the nearest ten, hundred, or thousand before subtracting. | 2.3.1 Answer: To best estimate 673 - 391, you would subtract:<br>(a) 400 from 600<br>(b) 300 from 600<br>(c) 400 from 700<br>(d) 300 from 700 | |
| | 2.3.2 Estimate by rounding to the nearest thousand and subtracting:<br>7103<br>-4987 | |

COMPETENCY GOAL 2: The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | | Measures | |
|---|---|---|---|
| 2.4 | Subtract any two whole numbers with several regroupings. | 2.4.1 | Subtract:<br>70,150<br>-6,985<br>(a) 76,835<br>(b) 64,165<br>(c) 66,165<br>(d) 63,165 |
| | | 2.4.2 | Subtract:<br>69,005<br>- 106 |
| 2.5 | Combine addition and subtraction using grouping symbols (i.e., parentheses). | 2.5.1 | Compute:<br>(846 + 359) - 459<br>(a) 646<br>(b) 846<br>(c) 745<br>(d) 746 |
| | | 2.5.2 | Compute:<br>197 + (872 - 563) |
| 2.6 | Find multiples and common multiples of two numbers. | 2.6.1 | Answer: Common multiples of 3 and 5 are:<br>(a) 0, 15, 30, 45<br>(b) 0, 3, 5, 15<br>(c) 3, 5, 15, 30<br>(d) 15, 30, 35, 50 |
| | | 2.6.2 | List the first nine multiples of 3 and 4 and circle the common multiples. |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| | Objectives | | Measures |
|---|---|---|---|
| 2.7 | Find the least common multiple of two numbers. | 2.7.1 | Answer: The least common multiple of 6 and 7 is:<br>(a) 2<br>(b) 3<br>(c) 13<br>(d) 42 |
| | | 2.7.2 | Give the least common multiple of:<br>(a) 6 and 8 ______<br>(b) 12 and 15 ______<br>(c) 3 and 6 ______ |
| 2.8 | Multiply up to a three-digit number by up to a three-digit number. | 2.8.1 | Multiply:<br>46<br>x20<br>(a) 920<br>(b) 4120<br>(c) 860<br>(d) 8120<br>736<br>x500<br>(a) 358,000<br>(b) 368,000<br>(c) 350,000<br>(d) 353,000 |
| | | 2.8.2 | Multiply:<br>(a) 73<br>x60<br>(b) 497<br>x300 |
| 2.9 | Multiply two three-digit numbers. | 2.9.1 | Multiply:<br>426<br>x382<br>(a) 5,538<br>(b) 151,632<br>(c) 161,732<br>(d) 162,732 |
| | | 2.9.2 | Multiply:<br>7465<br>x309 |
| 2.10 | Give quick recall to all basic division facts under timed conditions. | 2.10.1 | Orally give the quotient for simple division facts during timed intervals. |
| | | 2.10.2 | Give a possible divisor and dividend for a given quotient during a timed intervals. |

**COMPETENCY GOAL 2:** The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| **2.11 Find factors, common factors, and the greatest common factor of two numbers.** | 2.11.1 Answer: The greatest common factor of 42 and 56 is:<br>(a) 6<br>(b) 7<br>(c) 12<br>(d) 14<br>2.11.2 List the factors of 54 and 72. Circle all the common factors. What is the greatest common factor of these two numbers? ______ |
| **2.12 Define prime numbers and be able to determine whether a given number under one hundred is prime or composite.** | 2.12.1 Answer: Which of these numbers is prime?<br>(a) 27<br>(b) 51<br>(c) 17<br>(d) 58<br>2.12.2 Use the 100 board to show the prime numbers less than 100. |
| **2.13 Divide a three-digit number by a one-digit number.** | 2.13.1 Divide:<br>$6\,\overline{)546}$<br>(a) 81<br>(b) 96<br>(c) 86<br>(d) 91<br>2.13.2 Divide:<br>$5\,\overline{)305}$ |
| **2.14 Divide a three-digit number by a one-digit number. Check with a calculator.** | 2.14.1 Divide:<br>$6\,\overline{)76}$<br>(a) 11 R 10<br>(b) 16<br>(c) 11 R 4<br>(d) 12 R 4<br>2.14.2 Divide:<br>$4\,\overline{)52}$ $6\,\overline{)476}$ |

COMPETENCY GOAL 2: The learner will demonstrate ability and skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| 2.15 Divide a four-digit number by a one-digit number with regrouping. | 2.15.1 Divide:<br>$7\,\overline{)8356}$<br>(a) 1181 R 3<br>(b) 1193 R 2<br>(c) 1183 R 3<br>(d) 1193 R 5 |
| | 2.15.2 Divide:<br>$9\,\overline{)6356}$ |
| 2.16 Compute averages to the nearest whole number. | 2.16.1 Answer: The average of 78, 84, 56, 92, and 88 to the nearest whole number is:<br>(a) 79<br>(b) 80<br>(c) 81<br>(d) 78 |
| | 2.16.2 Answer: To the nearest whole number find the average of 16, 39, 27, and 59. |
| 2.17 Divide up to a five-digit number by a two-digit number. Check with a calculator. | 2.17.1 Divide:<br>$42\,\overline{)68754}$<br>(a) 163<br>(b) 1727<br>(c) 1737<br>(d) 1637 |
| | 2.17.2 Divide:<br>$30\,\overline{)77640}$ |
| 2.18 Solve two-step word problems using whole number computation. | 2.18.1 Answer: Tom washed six windows on Monday and four on Tuesday. If each window had nine panes, how many panes did he wash?<br>(a) 10<br>(b) 19<br>(c) 24<br>(d) 90 |
| | 2.18.2 Answer: Jane and Jo want to buy four pieces of candy for each student in their groups. There are 12 students in Jane's group and 16 students in Jo's group. How many pieces of candy should they buy? |

MATHEMATICS

Grade Level: 5 Skills/Subject Area: Fractions

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.1 Simplify fractions by dividing by the greatest common factor. | 3.1.1 $\frac{15}{20}$ in lowest terms is:<br>(a) $\frac{3}{5}$ (c) $\frac{5}{4}$<br>(b) 4 (d) $\frac{3}{4}$ |
|  | 3.1.2 Write in lowest terms:<br>(a) $\frac{24}{48}$ (b) $\frac{52}{52}$ (c) $\frac{10}{12}$ |
| 3.2 Find the lowest common denominator by finding the least common multiple of the denominators. | 3.2.1 In the fractions given, find the lowest common denominator (least common multiple).<br>$\frac{7}{8}$, $\frac{3}{10}$<br>(a) 80<br>(b) 10<br>(c) 20<br>(d) 40 |
|  | 3.2.2 Answer: The lowest common denominator (least common multiple) of the following fractions is ____ .<br>$\frac{1}{3}$, $\frac{2}{4}$ |

**COMPETENCY GOAL 3:** The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.3 Compare two fractions having different denominators using "greater than", "less than", or "equal to" symbols. | 3.3.1 Compare:<br>(a) $\frac{3}{4}\square\frac{5}{8}$ (c) $\frac{4}{5}\square\frac{5}{6}$<br>(b) $\frac{3}{8}\square\frac{2}{9}$ (d) $\frac{6}{8}\square\frac{3}{4}$ |
| | 3.3.2 Which symbol belongs in the box?<br>$\frac{2}{5}\square\frac{3}{7}$<br>(a) ><br>(b) <<br>(c) =<br>(d) < or > |
| 3.4 Add or subtract fractions with unlike denominators. | 3.4.1 Add:<br>$\begin{array}{r} \frac{1}{4} \\ +\frac{2}{3} \\ \hline \end{array}$<br>(a) $\frac{3}{7}$<br>(b) $\frac{11}{12}$<br>(c) $\frac{10}{7}$<br>(d) $\frac{12}{12}$ |
| | 3.4.2 Subtract:<br>$\begin{array}{r} \frac{4}{5} \\ -\frac{3}{4} \\ \hline \end{array}$ |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.5 Change a fraction greater than one to a mixed number. | 3.5.1 Which fraction is equivalent to $\frac{27}{5}$ ?<br>(a) $5\frac{2}{5}$<br>(b) $5\frac{3}{5}$<br>(c) $4\frac{2}{5}$<br>(d) $6\frac{2}{5}$ |
| | 3.5.2 Write as a mixed number or as a whole number.<br>(a) $\frac{57}{3}$ (b) $\frac{49}{7}$ (c) $\frac{73}{3}$ |
| 3.6 Change a mixed number to an improper fraction. | 3.6.1 Which fraction is equivalent to $2\frac{3}{4}$ ?<br>(a) $\frac{11}{4}$ (b) $\frac{24}{4}$<br>(c) $\frac{6}{4}$ (d) $\frac{9}{4}$ |
| | 3.6.2 Change to improper fractions:<br>(a) $5\frac{3}{8}$ (b) $8\frac{1}{9}$ (c) $7\frac{7}{8}$ |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.7 Add or subtract mixed numbers with common denominators. | 3.7.1 Add:<br>$\begin{array}{r} 2\frac{3}{8} \\ + \quad 4\frac{2}{8} \\ \hline \end{array}$<br>(a) $6\frac{6}{8}$<br>(b) $6\frac{15}{16}$<br>(c) $6\frac{5}{8}$<br>(d) $6\frac{5}{8}$<br>3.7.2 Subtract:<br>$\begin{array}{r} 4\frac{5}{9} \\ - \quad \frac{3}{9} \\ \hline \end{array}$ |
| 3.8 Find a fractional part of a whole number. | 3.8.1 Solve:<br>$\frac{2}{3}$ of 21 =<br>(a) 7<br>(b) 9<br>(c) 11<br>(d) 14<br>3.8.2 Solve:<br>(a) $\frac{5}{7}$ of 35 =<br>(b) $\frac{2}{3}$ of 18 = |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.9 Multiply a fraction by a fraction. | 3.9.1 Multiply:<br>$\frac{1}{2} \times \frac{3}{4} =$ (a) $\frac{3}{8}$ (c) $\frac{2}{3}$<br>(b) $\frac{3}{6}$ (d) 24<br>3.9.2 $\frac{2}{5} \times \frac{3}{2} =$ |
| 3.10 Divide a whole number by a fraction. | 3.10.1 Divide:<br>$3 \div \frac{1}{4} = \underline{\ ?\ }$ (a) $\frac{3}{8}$ (c) $\frac{1}{12}$<br>(b) 12 (d) $\frac{4}{3}$<br>3.10.2 Divide:<br>$4 \div \frac{3}{4} = \underline{\ ?\ }$ |

## MATHEMATICS

Grade Level: 5 Skills/Subject Area: Decimals

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.1 Give the place value for any digit in a decimal numeral through thousandths. | 4.1.1 Answer: The 5 in .065 is in the ______ place.<br>(a) ones<br>(b) tenths<br>(c) hundredths<br>(d) thousandths |
| | 4.1.2 What place value does the 3 have in the standard numbers below?<br>(a) .032 ________<br>(b) .053 ________ |
| 4.2 Read and write decimals through thousandths. | 4.2.1 Answer: .068 is read:<br>(a) sixty-eight hundredths<br>(b) sixty-eight tenths<br>(c) sixty-eight thousandths<br>(d) sixty-eight thousands |
| | 4.2.2 Write standard numerals for:<br>(a) fifteen hundredths. ________<br>(b) twenty-five thousandths. ________ |
| 4.3 Compare decimals using >, <, or = symbols up to thousandths. | 4.3.1 Compare. Which symbol belongs in the box?<br>.40 ☐ .4<br>(a) ><br>(b) <<br>(c) =<br>(d) > or < |
| | 4.3.2 Greater than, less than, or equal to? Insert the correct symbol.<br>(a) 6 5.999<br>(b) .544 .54<br>(c) .30 .3<br>(d) .56 .612 |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.4 Add decimal numbers, each having no more than three decimal places. | 4.4.1 Add:<br>$\begin{array}{r} .359 \\ \underline{+\ .067} \end{array}$<br>(a) .426<br>(b) .312<br>(c) .416<br>(d) .316 |
| | 4.4.2 Add:<br>(a) .102 + .736<br>(b) 3.013 + 2.925 |
| 4.5 Subtract decimals, each having no more than three decimal places. | 4.5.1 Subtract:<br>$\begin{array}{r} .543 \\ \underline{-.306} \end{array}$<br>(a) .243<br>(b) .237<br>(c) .849<br>(d) .236 |
| | 4.5.2 Subtract:<br>$\begin{array}{r} .796 \\ \underline{-.037} \end{array}$ |
| 4.6 Multiply a decimal by a decimal up to four places. | 4.6.1 Multiply:<br>.342 x .2 = |
| | 4.6.2 Multiply two hundred eight thousandths by four hundred fifty hundredths. |
| 4.7 Divide a decimal by a decimal up to three places. | 4.7.1 Divide:<br>$.32\overline{)4.327}$ |
| | 4.7.2 Divide:<br>$2.7\overline{)4.087}$ |

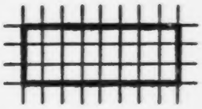
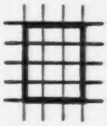
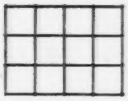
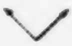
MATHEMATICS

Grade Level: 5 Skills/Subject Area: Measurement

COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.1 Rename periods of time using days, hours, minutes, and seconds. | 5.1.1 Complete:<br>432 hours = ________ days<br>(a) 8<br>(b) 10<br>(c) 18<br>(d) 19 |
| | 5.1.2 Complete:<br>8 hours = _______ minutes<br>22 days = _______ hours<br>16 minutes = _______ seconds |
| 5.2 Measure length using metric units (millimeters, centimeters, meters, and kilometers). | 5.2.1 Answer: Which is the best unit for measuring the distance between Raleigh and Charlotte?<br>(a) The millimeter<br>(b) The centimeter<br>(c) The meter<br>(d) The kilometer |
| | 5.2.2 Answer: The _________ is the best unit for measuring the length of a soccer field. (millimeter, centimeter, meter, kilometer). |
| 5.3 Measure length using customary units (inches, feet, yards, miles). | 5.3.1 Answer: Which unit is best for measuring the length of a football field?<br>(a) inch<br>(b) foot<br>(c) yard<br>(d) mile |
| | 5.3.2 Answer: The __________ is the best unit for measuring the length of your pencil. (inch, foot, yard, mile). |

COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.4 Find area of rectangles by counting and computing. | 5.4.1 Answer: What is the area of the rectangle shown?<br>(a) 21 square units<br>(b) 24 square units<br>(c) 27 square units<br>(d) 22 square units<br><br>5.4.2 Answer: The area of the rectangle below is _________ square units.<br> |
| 5.5 Find area of rectangles in customary or metric units using a formula. | 5.5.1 Use the formula A=lw to find the area of the rectangle shown.<br>(a) 45 square meters<br>(b) 60 square meters<br>(c) 49 square meters<br>(d) 14 square meters<br> |
| 5.6 Use Celsius and Fahrenheit thermometers to determine boiling and freezing points of water. | 5.6.1 The boiling point of water on a Celsius thermometer is:<br>(a) 0°C<br>(b) 50°C<br>(c) 100°C<br>(d) 212°C<br>5.6.2 The freezing point of water on a Celsius thermometer is ______°C. |
| 5.7 Measure angles using a protractor. | 5.7.1 Measure the angle using a protractor.<br>(a) 45°<br>(b) 80°<br>(c) 90°<br>(d) 180°<br><br>5.7.2 Use a protractor to draw angles having these measures.<br>(a) 35°<br>(b) 20° |

## MATHEMATICS

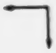
**Grade Level: 5** **Skills/Subject Area: Geometry**

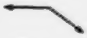
**COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.**

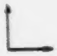
**Objectives** | **Measures**

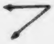
**6.1 Identify angles as acute, right, or obtuse.**

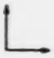
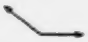
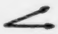
**6.1.1 Which shows an acute angle.**

(a)


(c)


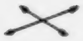
(b)


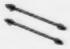
(d)


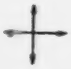
**6.1.2 Answer: Acute, obtuse, or right?**




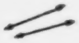
**6.2 Identify parallel and perpendicular lines.**

**6.2.1 Answer: Which are perpendicular lines?**

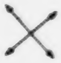
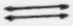
(a)


(c)


(b)


(d)


**6.2.2 Answer: Parallel or perpendicular?**

**6.3 Identify corresponding parts of congruent figures.**

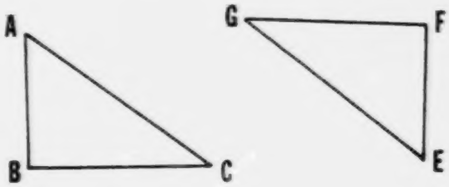
**6.3.1 Answer: Which is true concerning the corresponding parts of these congruent figures.**

(a) $\overline{FE} \cong \overline{AC}$

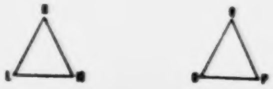
(b) $\overline{FE} \cong \overline{AB}$

(c) $\overline{BC} \cong \overline{FE}$

(d) $\overline{AC} \cong \overline{GF}$



**6.3.2 List corresponding angles of these congruent figures.**

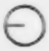


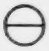
COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.

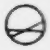
Competency Indicators | Competency Measures

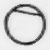
6.4 Construct a circle with a compass and name the parts (radius, diameter).

6.4.1 Which shows the radius of a circle?

a. 

c. 

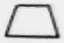
b. 

d. 

6.4.2 Using a compass, construct a circle. Draw a diameter for the circle.

6.5 Recognize special triangles (isosceles, equilateral, and scalene) and quadrilaterals (parallelogram, rhombus, trapezoid).

6.5.1 Which shows a rhombus?

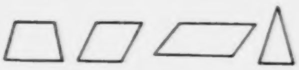
a. 

c.

b.

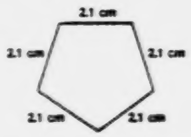
d.

6.5.2 Label these shapes:



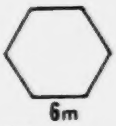
6.6 Estimate the perimeter of a given figure to nearest centimeter. Measure to prove accuracy.

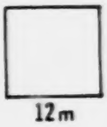
6.6.1 What is the perimeter of the figure shown?

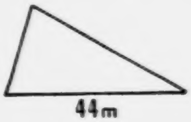


a. 13 centimeters
b. 14 centimeters
c. 15 centimeters
d. 20 centimeters

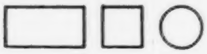
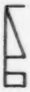
6.6.2 Find the perimeter of each figure. Use calculator to compute.







COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.

| Competency Indicators | Competency Measures |
|---|---|
| 6.7 Make a given figure symmetrical. | 6.7.1 Trace each figure. Draw as many lines of symmetry as you can. How many lines of symmetry does each figure have?  |
| | 6.7.2 Make the figure symmetrical.  |

## MATHEMATICS

**Grade Level:** 5 **Skills/Subject Area:** Probability & Statistics

**COMPETENCY GOAL 7:** The learner will demonstrate an understanding of graphs, tables, and simple statistics.

| Objectives | Measures |
|---|---|
| 7.1 Gather information, construct, and interpret bar, line, and circle graphs. | 7.1.1 Answer: Mr. Ogden owns a small bookstore. He keeps a close count on the number of books sold so he can restock his shelves. How many sports and fiction books were sold in January?<br>(a) 141<br>(b) 140<br>(c) 139<br>(d) 142 |
| | 7.1.2 Answer: Were there more fiction books sold than all others? |

January Inventory

| Topic | No. of Books | No. of Books Sold |
|---|---|---|
| Computer Usage | 973 | 63 |
| Sports | 127 | 16 |
| Fiction | 2,568 | 125 |
| Travel | 112 | 2 |
| Cooking | 106 | 5 |
| Beauty | 157 | 12 |

Grade 6 Outline

1. Numeration
   - a. Write expanded notation for all numbers less than one billion.
   - b. Give place value of a digit in a number less than one billion.
   - c. Round numbers to an indicated place, through millions.
   - d. Compare two numbers with the same number of digits.

2. Whole Numbers
   - a. Add and subtract numbers up to six digits with regrouping.
   - b. Multiply and divide with regrouping.
   - c. Find the prime factorization of a composite number.
   - d. Solve problems.

3. Fractions
   - a. Add or subtract mixed numbers with regrouping.
   - b. Multiply and divide a whole number by a fraction, two fractions, a whole number by a mixed number, two mixed numbers.

4. Decimals
   - a. Read and write numerals or word names for decimals through thousandths.
   - b. Compare two numbers with up to four digits to the right of the decimal.
   - c. Round decimals to the nearest tenth, hundredth, thousandth.
   - d. Add, subtract, multiply, and divide two numbers in decimal form.
   - e. Divide a decimal by a whole number or a decimal.
   - f. Solve problems.

5. Measurement
   - a. Add or subtract hours, minutes, seconds.
   - b. Find the beginning, end, or amount of elapsed time, given two of the three.
   - c. Determine the volume of a rectangular solid.
   - d. Find the circumference and area of a circle.
   - e. Compare metric and customary units; convert within each system.
   - f. Find temperature in degrees Celsius and Fahrenheit.
   - g. Solve problems.

6. Geometry
   - a. Find the perimeter, area, and volume of given geometric figures.
   - b. Measure angles to the nearest degree; use letters to name them.
   - c. Identify special triangles and quadrilaterals.

d. Determine lines of symmetry in given figures.
e. Construct a figure congruent to a given figure.
f. Sort triangles according to attributes.
g. Estimate the area of a given figure.
h. Solve problems.

7. Probability and Statistics

a. Predict outcomes in problems involving gathering, sorting, organizing, and tallying information.
b. Read and interpret graphs and scale drawings.
c. Find the average of a given set of numbers.
d. Find a percent of a number.
e. Find what percent one number is of another.

MATHEMATICS

Grade Level: 6 Skills/Subject Area: Numeration

COMPETENCY GOAL 1: The learner will demonstrate an understanding of numeration.

| Objectives | Measures |
|---|---|
| 1.1 **Give the place value of a digit in a number less than one billion.** | 1.1.1 **Answer: What is the place value of 8 in** 82,563,410?<br>**(a) ten thousands**<br>**(b) millions**<br>**(c) ten millions**<br>**(d) ten billions** |
| | 1.1.2 **Use a calculator to display a seven-digit number. Tell the value of the second number put into the calculator?** |
| 1.2 **Round numbers to an indicated place, up through millions.** | 1.2.1 Answer: 157,653 rounded to the nearest ten thousand is:<br>(a) 150,000<br>(b) 160,000<br>(c) 170,000<br>(d) 200,000 |
| | 1.2.2 **Answer:** 6,783,426 rounded to the nearest hundred thousand is ________________. |
| 1.3 **Compare two numbers using "greater than", "less than", or "equal to" symbols.** | 1.3.1 Answer: Which symbol belongs in the box?<br>78,426,981 ☐ 78,426,981<br>(a) >)<br>(b) <<br>(c) =<br>(d) > or < |
| | 1.3.2 Use >, <, = to compare:<br>97,486,342 79,486,342 |

MATHEMATICS

Grade Level: 6 Skills/Subject Area: Whole Numbers

COMPETENCY GOAL 2: The learner will demonstrate skill in computation of whole numbers.

| Objectives | Measures |
|---|---|
| 2.1 Add numbers up to six digits with regrouping. | 2.1.1 Add:<br>$\begin{array}{r} 47653 \\ +\ 2948 \\ \hline \end{array}$<br>(a) 49,591<br>(b) 50,501<br>(c) 50,601<br>(d) 49,601<br>2.1.2 Add:<br>(a) $\begin{array}{r} 5476 \\ +4683 \\ \hline \end{array}$ (b) $\begin{array}{r} 43590 \\ +2468 \\ \hline \end{array}$ (c) $\begin{array}{r} 854321 \\ +235497 \\ \hline \end{array}$ |
| 2.2 Subtract numbers up to six digits with regrouping. | 2.2.1 Subtract:<br>$\begin{array}{r} 405603 \\ -45974 \\ \hline \end{array}$<br>(a) 440,371<br>(b) 369,629<br>(c) 359,631<br>(d) 359,629<br>2.2.2 Subtract:<br>$\begin{array}{r} 140685 \\ -29768 \\ \hline \end{array}$ |
| 2.3 Multiply a five-digit number by a three- or four-digit number. | 2.3.1 Multiply:<br>$\begin{array}{r} 62315 \\ \times\ 4532 \\ \hline \end{array}$<br>(a) 282,411,580<br>(b) 292,412,680<br>(c) 282,401,580<br>(d) 282,411,680<br>2.3.2 Multiply:<br>$\begin{array}{r} 2168 \\ \times\ 327 \\ \hline \end{array}$ $\begin{array}{r} 4298 \\ \times 2167 \\ \hline \end{array}$ |
| 2.4 Divide a five-digit number by a two-digit number. | 2.4.1 Divide:<br>$70\overline{)6508}$<br>(a) 92 R 58<br>(b) 92 R 68<br>(c) 90 R 68<br>(d) 92 R 60<br>2.4.2 Divide:<br>(a) $58\overline{)5921}$ (b) $42\overline{)32671}$ |

COMPETENCY GOAL 2: The learner will demonstrate skill in computation of whole numbers.

| | Objectives | | Measures |
|---|---|---|---|
| 2.5 | Find the prime factorization of a composite number. | 2.5.1 | Answer: Which is the prime factorization of 72?<br>(a) 3 x 2 x 2 x 2<br>(b) 3 x 2 x 4<br>(c) 9 x 8<br>(d) 3 x 3 x 2 x 2 x 2 |
| | | 2.5.2 | Give the prime factorization of:<br>(a) 28 (b) 45 (c) 24 |
| 2.6 | Solve word problems containing extraneous information. | 2.6.1 | Answer: Janie, Mary, and Kay each made eight valentines. They gave away four. How many valentines did they make?<br>(a) 12<br>(b) 24<br>(c) 32<br>(d) 48 |
| | | 2.6.2 | Mark through the information not needed to solve this problem:<br>Jim had 28 marbles. He gave 11 to Phil. Phil gave 3 to Joe and 2 to Al. How many marbles does Jim have left? |

# MATHEMATICS

**Grade Level:** 6 Skills/Subject Area: Fractions

**COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.**

| **Objectives** | **Measures** |
|---|---|

**3.1 Add or subtract mixed numbers with regrouping.**

3.1.1 Add:

$$\begin{array}{r} 5\frac{4}{7} \\ +\ 6\frac{9}{14} \\ \hline \end{array}$$

(a) $11\frac{13}{14}$

(b) $11\frac{14}{17}$

(c) $12\frac{4}{14}$

(d) $12\frac{3}{14}$

3.1.2 Subtract:

$$\begin{array}{r} 4\frac{2}{5} \\ -\ 1\frac{7}{10} \\ \hline \end{array}$$

(a) $3\frac{5}{5}$

(b) $2\frac{7}{10}$

(c) $5\frac{9}{15}$

(d) $3\frac{7}{10}$

3.2 Multiply a whole number by a fraction.

3.2.1 Multiply:

$15 \times \frac{3}{5} =$

(a) 8
(b) 15
(c) 30
(d) 9

3.2.2 Multiply:

$18 \times \frac{3}{9} =$

**COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.**

| Objectives | Measures |
|---|---|
| 3.3 Multiply two fractions reducing to lowest terms as needed. | 3.3.1 Multiply:<br>$\frac{2}{3} \times \frac{3}{5}$<br>(a) $\frac{2}{5}$<br>(b) $\frac{5}{8}$<br>(c) $\frac{5}{15}$<br>(d) $\frac{9}{10}$ |
| | 3.3.2 Multiply:<br>(a) $\frac{5}{6} \times \frac{1}{3} =$ (b) $\frac{2}{3} \times \frac{3}{4} =$ (c) $\frac{1}{3} \times \frac{3}{5} =$ |
| 3.4 Multiply a whole number by a mixed number. | 3.4.1 Multiply:<br>$8 \times 3\frac{1}{4} =$<br>(a) 13<br>(b) 16<br>(c) $24\frac{1}{4}$<br>(d) 26 |
| | 3.4.2 Multiply:<br>$6 \times 2\frac{1}{3} =$ |
| 3.5 Multiply two mixed numbers. | 3.5.1 Multiply:<br>$4\frac{2}{5} \times 2\frac{2}{3} =$<br>(a) $8\frac{4}{15}$<br>(b) $8\frac{6}{10}$<br>(c) $11\frac{10}{15}$<br>(d) $11\frac{11}{15}$ |
| | 3.5.2 Multiply:<br>$3\frac{1}{2} \times 2\frac{5}{6} =$ |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.6 Divide a fraction by a whole number. | 3.6.1 Divide:<br>$\frac{3}{4} \div 7 =$<br>(a) $\frac{4}{28}$<br>(b) $\frac{3}{28}$<br>(c) $\frac{21}{28}$<br>(d) $\frac{21}{4}$ |
| | 3.6.2 Divide:<br>$\frac{4}{5} \div 3 =$ |
| 3.7 Divide a fraction by a fraction. | 3.7.1 Divide:<br>$\frac{1}{5} \div \frac{5}{6} =$<br>(a) $\frac{6}{25}$<br>(b) $\frac{6}{30}$<br>(c) $\frac{5}{30}$<br>(d) $\frac{25}{6}$ |
| | 3.7.2 Divide:<br>$\frac{5}{9} \div \frac{3}{6} =$ |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | | Measures |
|---|---|---|
| 3.8 Divide mixed numbers. | 3.8.1 | Divide:<br>$3\frac{1}{2} \div 1\frac{3}{4} =$<br>(a) 2<br>(b) 4<br>(c) 6<br>(d) $8\frac{1}{6}$ |
| | 3.8.2 | Divide:<br>$7\frac{1}{2} \div 2\frac{1}{2} =$ |
| 3.9 Write a fraction as a decimal. | 3.9.1 | Write $\frac{3}{4}$ in decimal form.<br>(a) 75<br>(b) 57<br>(c) .75<br>(d) .075 |
| | 3.9.2 | Write $\frac{7}{8}$ as a decimal. |
| 3.10 Write a fraction as a percent. | 3.10.1 | Write $\frac{1}{2}$ as a percent.<br>(a) $\frac{1}{2}$ %<br>(b) 50 %<br>(c) 2 %<br>(d) 500 % |
| | 3.10.2 | Write $\frac{2}{3}$ as a percent. |

MATHEMATICS

Grade Level: 6 Skills/Subject Area: Decimals

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| **4.1 Read and write either numerals or word names for decimals through ten thousandths.** | 4.1.1 Answer: 2.008 is read:<br>(a) two and eight thousands<br>(b) two and eight thousandths<br>(c) two and eight tenths<br>(d) two and eight hundredths<br>4.1.2 Write standard numerals for:<br>(a) fifty-six and eleven hundredths ________<br>(b) six hundred and twenty-one hundredths ________. |
| **4.2 Compare two number with up to four digits to the right of the decimal.** | 4.2.1 Use >, <, or = to compare:<br>2.0751 ☐ 2.7501<br>(a) ><br>(b) <<br>(c) =<br>(d) > or <<br>4.2.2 Answer: Use >, <, = to compare:<br>(a) 4.7681 4.7799 (c) 14.0012 14.0122<br>(b) 15.052 15.52 (d) 25.72 25.275 |
| **4.3 Find a decimal number that is between two given decimal numbers.** | 4.3.1 Answer: Which decimal comes between 6.2 and 6.6?<br>(a) 5.9<br>(b) 6.19<br>(c) 6.452<br>(d) 6.73<br>4.3.2 Give a decimal that is between the two given decimals.<br>(a) 15.82, ______, 15.825<br>(b) 1.0, _____, 1.04 |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.4 Round decimals to the nearest designated place (tenth, hundreth, or thousandth). | 4.4.1 35.496 rounded to the nearest tenth is ____.<br>(a) 35.4<br>(b) 35.5<br>(c) 36.500<br>(d) 35.056 |
| | 4.4.2 Round 7.6259 to the nearest:<br>(a) tenth ____<br>(b) hundredth ____<br>(c) thousandth ____ |
| 4.5 Add and subtract decimal numbers having a different number of places. | 4.5.1 Add:<br>7.95<br>+ .468<br>(a) 7.518<br>(b) 8.518<br>(c) 7.418<br>(d) 8.418 |
| | 4.5.2 Add or subtract:<br>(a) 6.4<br>+10.35<br>(b) 17.06<br>- 5.912<br>(c) 4.32 + 6.954 = ____<br>(d) 17.9 - 3.486 = ____ |
| 4.6 Multiply two numbers in decimal form. | 4.6.1 Multiply:<br>2.35<br>x3.44<br>(a) 6.084<br>(b) 8.084<br>(c) 6.79<br>(d) 8.074 |
| | 4.6.2 Multiply:<br>(a) .028<br>x0.03<br>(b) 5.8<br>x .36<br>(c) 5.9<br>x0.7<br>(d)5.63<br>x4.36 |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| **4.7 Multiply amounts of money and round the answer to the nearest cent.** | 4.7.1 Multiply and round to the nearest cent.<br>\$1.59<br>x 2.5<br>(a) \$3.00<br>(b) \$3.97<br>(c) \$3.98<br>(d) \$3.99 |
| | 4.7.2 Multiply. Then round the product to the nearest cent.<br>(a) \$3.28 x3.21<br>(b) \$1.97 x1.66 |
| **4.8 Divide a decimal number by a whole number where the quotient terminates.** | 4.8.1 Divide:<br>6 )2.958<br>(a) .393<br>(b) .492<br>(c) .493<br>(d) .593 |
| | 4.8.2 Divide:<br>(a) 8 )51.92<br>(b) 4 )3.708 |
| **4.9 Divide a decimal number by a whole number when writing one or more zeroes in the dividend is required before regrouping.** | 4.9.1 Divide:<br>6 )3.69<br>(a) 6.15<br>(b) .615<br>(c) 61.5<br>(d) 5.16 |
| | 4.9.2 Divide until the remainder is zero.<br>(a) 5 )7.25<br>(b) 6 )8.43<br>(c) 8 )6.44 |

**COMPETENCY GOAL 4:** The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.10 Divide a decimal by a decimal. | 4.10.1 Divide:<br>$.3\overline{)1.32}$<br>(a) .44<br>(b) 4.4<br>(c) 3.4<br>(d) .34 |
| | 4.10.2 Divide:<br>(a) $.21\overline{)5.46}$ (b) $.9\overline{)4.86}$ |
| 4.11 Write a decimal as a fraction. | 4.11.1 Write 0.5 as a fraction.<br>(a) $\frac{1}{2}$<br>(b) 2<br>(c) $\frac{1}{4}$<br>(d) 20 |
| | 4.11.2 Write 0.84 as a fraction. |
| 4.12 Write a decimal as a percent. | 4.12.1 Convert 0.25 to a percent.<br>(a) 25%<br>(b) 250%<br>(c) 2.5%<br>(d) 0.25% |
| | 4.12.2 Convert 1.35 to a percent. |

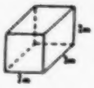
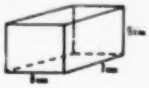
COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.13 Write a percent as a decimal or fraction. | 4.13.1 Convert 160% to a fraction.<br>(a) 160<br>(b) $\frac{3}{5}$<br>(c) 1<br>(d) $1\frac{3}{5}$ |
| | 4.13.2 Convert $37\frac{1}{2}$ to a decimal number. |
| 4.14 Find a percent of a number. | 4.14.1 Answer: 64% of 50 is:<br>(a) 23<br>(b) 32<br>(c) 20<br>(d) 25 |
| | 4.14.2 Find 70% of 20. |
| 4.15 Find what percent one number is of another number. | 4.15.1 Answer: Rob earned $8.00 mowing lawns. He put $5.00 into his savings account. What percent of his earnings did he save? |
| | 4.15.2 Answer: Six is what percent of 15? |

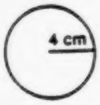
MATHEMATICS

**Grade Level:** 6 **Skills/Subject Area:** Measurement

**COMPETENCY GOAL 5:** The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.1 Add or subtract hours and minutes. | 5.1.1 Complete:<br>3 hours 20 minutes<br>4 hours 14 minutes<br>(a) 7 hours 34 minutes<br>(b) 6 hours 44 minutes<br>(c) 7 hours 44 minutes<br>(d) 7 hours 24 minutes<br>5.1.2 Complete. Regroup as needed.<br>7 hours 50 minutes<br>+ 1 hour 30 minutes |
| 5.2 Find the beginning, end, or amount of elapsed time given two of the three. | 5.2.1 Answer: If John left home at 9:45 a.m., what time did he return home if he was gone for four hours and ten minutes?<br>(a) 1:55 p.m.<br>(b) 1:55 a.m.<br>(c) 12:10 p.m.<br>(d) 2:55 p.m.<br>5.2.2 Answer: Classes at Lakeview Elementary School begin at 8:15 a.m. What time is school out if the school day lasts five hours and 45 minutes? |
| 5.3 Determine the volume of a rectangular solid. | 5.3.1 Answer: What is the volume of this rectangular solid?<br>(a) 12 square meters<br>(b) 12 cubic meters<br>(c) 7 cubic meters<br>(d) 14 cubic meters<br><br>5.3.2 Answer: What is the volume?<br> |

COMPETENCY GOAL 5: The learner will understand and use standard units of metric and customary measurement.

| Objectives | Measures |
|---|---|
| 5.4 Convert customary unit of measurement within the system. | 5.4.1 Complete:<br>8 pints = _____ quarts<br>(a) 2<br>(b) 4<br>(c) 5<br>(d) 6 |
|  | 5.4.2 Complete:<br>1 gallon = _____ cup(s)<br>3 feet = _____ yard(s)<br>16 quarts = _____gallon(s)<br>36 inches = _____foot(feet) |
| 5.5 Find the circumference and area of a circle. | 5.5.1 Find the circumference. Use 3.14 for $\pi$.<br> |
|  | 5.5.2 Answer: Mrs. Crews has a circular rug. Its radius is 1.5 m. What is its area? |

# MATHEMATICS

**Grade Level:** 6 Skills/Subject Area: Geometry

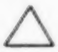
COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.

| Objectives | Measures |
|---|---|

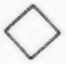
**6.1 Identify special triangles (equilateral, isosceles, scalene, right, obtuse, and acute), and quadrilaterals (parallelogram, rectangle, rhombus, square, trapezoid, isoceles trapezoid, and kite).**

6.1.1 Answer: Which is an isosceles trapezoid?

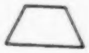
(a)



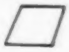
(b)



(c)



(d)



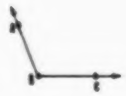
6.1.2 Answer: A triangle with three congruent sides is a (an) ________________ triangle.

A triangle with two congruent sides is a (an) ________________ triangle.

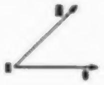
**6.2 Name angles using letters.**

6.2.1 Answer: Three correct names for the angle shown are:

(a) ∠ ABC, ∠CBA, ∠ B
(b) ∠ A, ∠B, ∠C
(c) ∠ AB, ∠BC, ∠AC
(d) ∠ C, ∠A, ∠AC



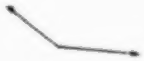
6.2.2 Give three names for the angle shown.



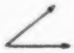
**6.3 Measure angles to the nearest degree.**

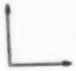
6.3.1 Answer: What is the measure of the angle?

(a) 45°
(b) 90°
(c) 150°
(d) 180°

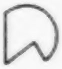
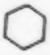
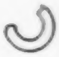
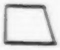
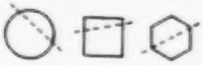
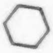
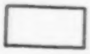
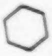
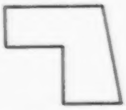
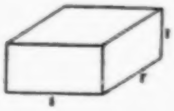
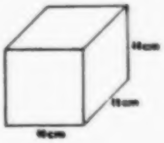


6.3.2 Answer: What is the measure of the angle?

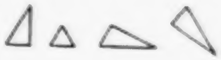
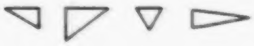




COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.

| Objectives | Measures |
|---|---|
| 6.4 Identify whether a given line is a line of symmetry. | 6.4.1 Answer: Which is symmetric with respect to a line?<br>(a) <br>(c) <br>(b) <br>(d)  |
|  | 6.4.2 Answer: Is the dashed line a line of symmetry?<br> |
| 6.5 Construct a figure congruent to a given figure. | 6.5.1 Answer: Which figure is congruent to this figure?<br><br>(a) <br>(c) <br>(b) <br>(d)  |
|  | 6.5.2 Construct a figure congruent to:<br> |
| 6.6 Determine the surface area of a rectangular solid. | 6.6.1 Answer: What is the area of this figure?-<br>(a) 20 square m<br>(b) 9 square m<br>(c) 38 square m<br>(d) 48 square m<br> |
|  | 6.6.2 Answer: The surface area of the figure below is ______________.<br> |

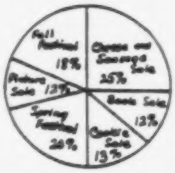
COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes.

| Objectives | Measures |
|---|---|
| 6.7 Sort triangles according to attributes. | 6.7.1 Give the set to which each triangle would belong:<br>(a) equilateral<br>(b) isosceles<br> |
| | 6.7.2 Sort the triangles and tell what kind they are.<br> |

**Grade Level: 6** **Skills/Subject Area:** Probability & Statistics

**COMPETENCY GOAL 7: The learner will be able to demonstrate an understanding of graphs, tables, and simple statistics.**

| Objectives | | Measures |
|---|---|---|
| **7.1 Predict outcomes in problems involving gathering, sorting, organizing, and tallying information.** | **7.1.1** | **Answer: This circle graph shows how the P.T.A. earned $6,000 to buy computers at South Elementary School. Which activity raised the most money?** |



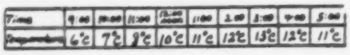
(a) Cheese and Sausage Sale
(b) Spring Festival
(c) Cookie Sale
(d) Fall Festival

7.1.2 **Answer: How much money was made from the Cheese and Sausage Sale?**

**7.2 Read, interpret, and construct graphs.**

7.2.1 **Make a line graph showing the outside temperature in degrees Celsius each day of the week at 9:00 a.m. Make a grid and label the lines so all information will fit. Make dots for days and degrees and join the dots with segments.**

7.2.2 **Answer: Here is a set of information. Make a line graph to show the information.**



| Time | 9:00 | 10:00 | 11:00 | 12:00 noon | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 |
|---|---|---|---|---|---|---|---|---|---|
| [illegible] | 6°C | 7°C | 9°C | 10°C | 11°C | 12°C | 15°C | 12°C | 11°C |

**7.3 Find the average of a given set of numbers.**

7.3.1 **Answer: To the nearest whole number the average of 154, 326, 485, 219, and 312 is:**

(a) 297
(b) 298
(c) 299
(d) 300

7.3.2 **Find, to the nearest whole number, the average of 426, 832, 940, and 680.**

# GRADES 7-8

## Major Emphases

In the seventh and eighth grades, the skills developed in the elementary grades are reviewed and extended. The program offers students of all ability levels the opportunity to develop a better understanding of numbers, improve their ability to reason and be exposed to some exciting new areas of mathematics. The topics emphasized at these grade levels are operations on rational numbers, beginning algebra, informal geometry, measurement, graphs, scale drawings, elementary probability and statistics, and problem-solving. The use of calculators and computers to enhance and enrich the mathematics program is also encouraged.

## Grade 7 Outline

1. Numeration
   - a. Read and write word names for whole numbers.
   - b. Read and write numerals for whole numbers.
   - c. Name the value of digits.
   - d. Round a number to a designated place.
   - e. Compare two or more numbers.

2. Whole Numbers
   - a. Estimate sums, differences, products, and quotients.
   - b. Add, subtract, multiply, and divide whole numbers.
   - c. Raise a whole number to a given power.
   - d. Express a product in its exponential form.
   - e. Find the square root of a number using a table or calculator.
   - f. Determine factors.
   - g. Identify and use number properties.
   - h. Solve problems.

3. Fractions
   - a. Read and write.
   - b. Identify.
   - c. Convert to equivalent fractions.
   - d. Add, subtract, multiply, and divide.
   - e. Estimate sums, differences, products, and quotients.
   - f. Find the reciprocal of a given fraction.
   - g. Compare any two fractions.
   - h. Solve problems.

4. Decimals
   - a. Read and write decimals.
   - b. Read and write money values.
   - c. Compare any two decimals.
   - d. Round to tenths, hundredths, thousandths.
   - e. Estimate sums, differences, products, and quotients.
   - f. Add, subtract, multiply, and divide.
   - g. Solve problems.

5. Ratio, Proportion, and Percent
   - a. Express a comparison of two numbers as a ratio.
   - b. Find the missing term of a proportion.
   - c. Define percent.
   - d. Convert fractions and decimals to percents.
   - e. Solve problems.

6. Geometry

   a. Identify parts of geometric figures.
   b. Classify polygons.
   c. Classify lines.
   d. Identify and classify angles, triangles, and space figures.
   e. Identify parts of a circle.
   f. Construct segments, angles, and triangles.
   g. Bisect segments and angles.

7. Measurement

   a. Determine elapsed time.
   b. Determine length, width, and height of objects in customary and metric units.
   c. Determine capacity of liquids in customary and metric units.
   d. Determine the mass of objects in customary and metric units.
   e. Determine temperature in degrees Celsius and Fahrenheit.
   f. Solve problems involving length, liquid measure, and mass.
   g. Find the perimeter and area of polygons.
   h. Determine the area of a circle.

8. Probability and Statistics

   a. Construct, read, and interpret graphs, tables, maps, and charts.
   b. Locate points on maps and graphs.
   c. Determine the mean, median and mode for a given set of data.

9. Integers

   a. Compare any two integers.
   b. Arrange in increasing and decreasing order.
   c. Name the additive inverse of a given integer.
   d. Add and subtract.

## MATHEMATICS

Grade Level: 7　　Skills/Subject Area: Mathematics

COMPETENCY GOAL 1: The learner will demonstrate an understanding of the decimal system of numeration.

| Objectives | Measures |
|---|---|
| 1.1 Read and write word names for whole numbers containing as many as seven digits. | 1.1.1 Read in words the following: 4,981<br>A. Four hundred eighty-one<br>B. Four thousand nine hundred eighty-one<br>C. Four thousand eight hundred ninety-one<br>D. Four thousand nine hundred and eighty-one<br>1.1.2 Write the numeral 655,036 in words. |
| 1.2 Read and write the numeral for any whole number less than ten million. | 1.2.1 Choose the numeral that is the same as the word name in the box.<br>Three hundred fifteen<br>A. 315<br>B. 350<br>C. 351<br>D. 3015<br>1.2.2 Write the numeral 7,621,034 in words. |
| 1.3 Name the total value of a given digit of a whole number less than ten million. | 1.3.1 In the numeral 6,489,143, the value of the 9 is :<br>A. 900<br>B. 9,000<br>C. 90,000<br>D. 900,000<br>1.3.2 In the numeral 7,621,034 the value of the 6 is? |

COMPETENCY GOAL 1: The learner will demonstrate an understanding of the decimal system of numeration.

| Objectives | Measures |
|---|---|
| 1.4 Round a whole number smaller than 10,000,000 to any designated place. | 1.4.1 Round 1699 to the nearest hundred.<br>A. 1690<br>B. 1700<br>C. 1710<br>D. None of the above<br>1.4.2 Round 7,864,329 to the nearest million. |
| 1.5 Use <, =, or > to compare any two whole numbers. | 1.5.1 Which sign goes in the circle to make this a true statement?<br>425 ○ 326<br>A. < (is less than)<br>B. > (is greater than)<br>C. ≤ (is less than or equal to)<br>D. = (equals)<br>1.5.2 Which sign goes in the box to make the statement true?<br>Use one of the following signs:<br><, = or ><br>19 ☐ 46 |

## MATHEMATICS

Grade Level: 7 Skills/Subject Area: Mathematics

COMPETENCY GOAL 2: The learner will compute with whole numbers.

| Objectives | Measures |
|---|---|
| 2.1 Estimate the sum of any three numbers by rounding. | 2.1.1 Estimate the sum to the nearest 1,000:<br>8847<br>9999<br>+6300<br>A. 30,000<br>B. 23,000<br>C. 24,000<br>D. 25,000 |
| | 2.1.2 Estimate the following sum to the nearest 100:<br>4836<br>2547<br>+6214 |
| 2.2 Add any three numbers. | 2.2.1 Add: 3286<br>4261<br>+5872<br>A. 13,419<br>B. 12,219<br>C. 13,219<br>D. 13,319 |
| | 2.2.2 Add: 4836<br>6214<br>+4196 |
| 2.3 Estimate the difference between two numbers by rounding. | 2.3.1 Estimate the difference to the nearest 100.<br>6040<br>-2033<br>A. 4,000<br>B. 4,100<br>C. 4,013<br>D. 3,907 |
| | 2.3.2 Estimate the difference to the nearest 1,000:<br>6040<br>-2033 |

COMPETENCY GOAL 2: The learner will compute with whole numbers.

| Objectives | Measures |
|---|---|
| 2.4 Subtract any two 4-digit numbers. | 2.4.1 Subtract and choose the best answer:<br>7093 - 2881 =<br>A. 5212<br>B. 4212<br>C. 5812<br>D. None of these |
| | 2.4.2 Subtract: 7,804<br>-2,983 |
| 2.5 Use appropriate problem solving strategies to solve word (or story) problems, e.g. situations where the information is insufficient, sufficient or extraneous. | 2.5.1 Solve the following problem.<br>John has $55; Jim has $48; Bill has $39. Jim has $___ more than Bill.<br>A. Extraneous information given.<br>B. Sufficient information given.<br>C. Insufficient information given.<br>D. None of the above. |
| | 2.5.2 Can you solve the problem with the information given? Circle yes or no.<br>Sam caught 426 worms before going fishing at 4:30 Saturday morning. If he used all but 198 worms, how many fish did he catch? Assume he caught one fish for each worm used. |
| 2.6 Translate a one-step problem solving situation into an appropriate mathematical sentence. | 2.6.1 Read the problem and write a mathematical sentence to describe it.<br>The Scouts of Troop 62 hiked an average of 13 miles a day on a 17 day camping trip. How many miles did they hike in all?<br>A. 62 + 13 + 17 = 221 miles<br>B. 13 x 17 = 62 miles<br>C. 62 - 13 = 17 miles<br>D. 13 x 17 = 221 miles |
| | 2.6.2 Write the mathematical sentence needed to solve the following problem. The number of shares of IBM stock rose from 1,864 to 4,864. Find the amount of increase. |

COMPETENCY GOAL 2: The learner will compute with whole numbers.

| Objectives | Measures |
|---|---|
| 2.7 Estimate and then determine the solution of a problem solving situation involving the addition or subtraction of up to 4-digit numbers. | 2.7.1 Solve the following: If a car has 9,486 miles on its odometer at the end of a trip and it began with 7,969, about how many miles long was the trip?<br>A. 17,000<br>B. 100<br>C. 2,000<br>D. 1,000 |
|  | 2.7.2 Solve the following: The Girl Scouts planned to sell peanuts. They sold 4,842 bags but had 3,464 left. How many bags did they have in the beginning? |
| 2.8 Estimate and then determine the product of any two numbers. | 2.8.1 Choose the best answer by estimating.<br>767 x 34<br>A. 24,078<br>B. 3,068<br>C. 26,078<br>D. Not Given |
|  | 2.8.2 Estimate the product: 984 x67 |
| 2.9 Estimate and then determine the solution to a problem involving multiplication of any two numbers. | 2.9.1 Estimate and choose the best answer.<br>302 x 32<br>A. 9,000<br>B. 1,000<br>C. 600<br>D. 9,600 |
|  | 2.9.2 Solve: An airplane averages 1,090 kilometers per hour for a 12-hour flight from Chicago to Hong Kong. What is the distance in kilometers between Chicago and Hong Kong? |

COMPETENCY GOAL 2: The learner will compute with whole numbers.

| Objectives | Measures |
|---|---|
| 2.10 Divide a 3-digit number by a multiple of 10 less than 100. | 2.10.1 Divide and choose the best answer.<br>$70\,\overline{)420}$<br>A. 7<br>B. 6<br>C. 8<br>D. Not Given<br>2.10.2 Solve:<br>$80\,\overline{)560}$ |
| 2.11 Estimate the quotient of a 4-digit number divided by a 2-digit number. | 2.11.1 Estimate the quotient and choose the best answer:<br>$95\,\overline{)8{,}945}$<br>A. 100<br>B. 900<br>C. 90<br>D. 80<br>2.11.2 Estimate the quotient to the nearest hundred.<br>$45\,\overline{)4{,}510}$ |
| 2.12 Divide a 6-digit number by a 2-digit number. | 2.12.1 Divide and choose the best answer.<br>$45\,\overline{)4{,}410}$<br>A. 100<br>B. 98<br>C. 0090<br>D. 91<br>2.12.2 Divide: $34\,\overline{)227{,}812}$ |

COMPETENCY GOAL 2: The learner will compute with whole numbers.

| Objectives | Measures |
|---|---|
| 2.13 Raise a number to a given power. | 2.13.1 Solve $4^2 = \boxed{\phantom{00}}$. Choose the best answer.<br>A. 8<br>B. 6<br>C. 16<br>D. Forty-two |
| | 2.13.2 Solve $3^3$ |
| 2.14 Express a product in its exponential form. | 2.14.1 Express the following product in exponential form and choose the best answer.<br>$5 \times 5 \times 5 = \boxed{\phantom{00}}$<br>A. 15<br>B. 3 x 5<br>C. $5^3$<br>D. 5 x 3 |
| | 2.14.2 Express the following product in exponential form:<br>$6 \times 6 \times 6 \times 6 = \boxed{\phantom{00}}$ |
| 2.15 Find the square root of a number by using a table of square roots or a calculator. | 2.15.1 Use a calculator to find the<br>$\sqrt{144}$ Choose the best answer.<br>A. 3.795<br>B. 12<br>C. 1.2<br>D. Not Given |
| | 2.15.2 Use a calculator to find the square root of 41 to the nearest thousandth. Write your answer in the box.<br>$\boxed{\phantom{00}}$ |
| 2.16 Determine the factors of a whole number. | 2.16.1 2, 3, and 12 are all factors of what number?<br>A. 24<br>B. 18<br>C. 6<br>D. 30 |
| | 2.16.2 Write the factors of the number<br>$\boxed{36}$. |

COMPETENCY GOAL 2: The learner will compute with whole numbers.

| Objectives | Measures |
|---|---|
| 2.17 Find the GCF (greatest common factor) of two whole numbers. | 2.17.1 Find the greatest common factor of 16 and 24. Choose the best answer.<br>A. 16<br>B. 24<br>C. 4<br>D. 8 |
| | 2.17.2 Find the greatest common factor of 18 and 21. |
| 2.18 Write a set of multiples of a whole number. | 2.18.1 The first five multiples of the whole number 4 are ? (Exclude zero.)<br>A. 4, 8, 12, 16, 20<br>B. 0, 4, 8, 12, 16<br>C. 0, 16, 32, 48, 64<br>D. 12, 24, 28, 32, 36 |
| | 2.18.2 Write the first five multiples of the whole number 6. |
| 2.19 Determine the LCM (least common multiple) of two whole numbers. | 2.19.1 Determine the least common multiple of 8 and 12.<br>A. 24<br>B. 2<br>C. 96<br>D. 44 |
| | 2.19.2 Find the least common multiple of 4 and 12. |
| 2.20 Use the Commutative, Associative, and Distributive Properties for Addition and Multiplication to complete computations. | 2.20.1 What property does this equation illustrate?<br>$(4 + 12) + 8 = 4 + (12 + 8)$<br>A. Commutative Property of Addition<br>B. Associative Property of Addition<br>C. Distributive Property of Addition<br>D. Zero Property of Addition |
| | 2.20.2 Write an equation which illustrates the Commutative Property of Multiplication. |

COMPETENCY GOAL 2: The learner will compute with whole numbers.

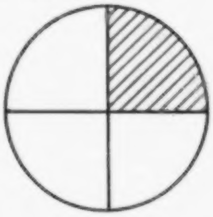
| Objectives | Measures |
|---|---|
| 2.21 Use zero in addition and one in multiplication as the Identity Elements for those operations. | 2.21.1 The equations below:<br>$a + 0 = a$ and $0 + a = a$ illustrate which property?<br>A. Zero Property of Addition<br>B. Commutative Property of Multiplication<br>C. The Identity Element for Multiplication<br>D. None of these |
| | 2.21.2 Solve:<br>$25 \cdot 1 =$ __________ |

MATHEMATICS

Grade Level: 7

Skills/Subject Area: Mathematics

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.1 Read and write fractions. | 3.1.1 Write the fraction $\frac{3}{4}$ in words.<br>Choose the best answer.<br>A. Four-thirds<br>B. Three four<br>C. Three-fourths<br>D. Four three |
| | 3.1.2 Write the fraction for the part which is shaded.<br> |
| 3.2 Change a fraction to its simplest form. | 3.2.1 Change $\frac{9}{12}$ to its simplest form.<br>Choose the best answer.<br>A. $\frac{4}{3}$<br>B. $\frac{3}{4}$<br>C. 3<br>D. $\frac{1}{3}$ |
| | 3.2.2 Change $\frac{8}{12}$ to its simplest form. |
| 3.3 Write a fraction equivalent to a given fraction. | 3.3.1 The fraction $\frac{1}{3}$ may be renamed as:<br>A. $\frac{2}{5}$<br>B. $\frac{2}{4}$<br>C. $\frac{2}{3}$<br>D. $\frac{2}{6}$ |
| | 3.3.2 $\frac{4}{8} = \frac{?}{32}$ |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| **3.4 Change an improper fraction to either a mixed number or a whole number.** | 3.4.1 Change $\frac{7}{2}$ to a whole number or a mixed number.<br>A. 7 C. $2\frac{2}{7}$<br>B. 2 D. $3\frac{1}{2}$ |
| | 3.4.2 Change the improper fraction $\frac{54}{4}$ to a whole number or mixed number. |
| **3.5 Change a mixed number or a whole number into an improper fraction.** | 3.5.1 Change the mixed number $4\frac{5}{6}$ to an improper fraction. Choose the best answer.<br>A. $\frac{45}{6}$<br>B. $\frac{34}{6}$<br>C. $\frac{9}{6}$<br>D. $\frac{29}{6}$ |
| | 3.5.2 Change the mixed number $6\frac{1}{3}$ to an improper fraction. |
| **3.6 Add two fractional numbers. Simplify the results.** | 3.6.1 Add $\begin{array}{r} \frac{1}{2} \\ +\frac{1}{6} \\ \hline \end{array}$ Choose the answer.<br>A. $\frac{1}{12}$ C. $\frac{2}{8}$<br>B. $\frac{1}{8}$ D. $\frac{2}{3}$ |
| | 3.6.2 Add $\begin{array}{r} \frac{1}{4} \\ +\frac{1}{3} \\ \hline \end{array}$ Write the answer in lowest terms. |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.7 Estimate the sum of two fractional numbers. | 3.7.1 Estimate the sum and choose the best answer.<br>$\begin{array}{r}\frac{1}{3}\\ +\frac{1}{9}\\ \hline\end{array}$<br>A. Almost one C. More than one<br>B. Less than $\frac{1}{2}$ D. None of these |
| | 3.7.2 Estimate the sum. $\begin{array}{r}\frac{1}{2}\\ +\frac{2}{3}\\ \hline\end{array}$ |
| 3.8 Add two mixed numbers. | 3.8.1 Choose the best answer.<br>$\begin{array}{r}4\frac{11}{12}\\ +1\frac{1}{3}\\ \hline\end{array}$<br>A. $5\frac{4}{5}$ C. $6\frac{1}{4}$<br>B. $5\frac{1}{4}$ D. None of these |
| | 3.8.2 Add $\begin{array}{r}4\frac{1}{8}\\ +\ 6\frac{1}{2}\\ \hline\end{array}$ |
| 3.9 Subtract two fractional numbers. | 3.9.1 Choose the best answer.<br>$\begin{array}{r}\frac{11}{12}\\ -\frac{1}{3}\\ \hline\end{array}$ A. $\frac{7}{12}$ C. $\frac{11}{36}$<br>B. $\frac{12}{15}$ D. None of these |
| | 3.9.2 Subtract $\begin{array}{r}\frac{3}{4}\\ -\frac{1}{8}\\ \hline\end{array}$ |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.10 Estimate the difference between two mixed numbers. | 3.10.1 Estimate and choose the best answer.<br>$\begin{array}{r} 2\frac{1}{5} \\ -\ 1\frac{4}{5} \\ \hline \end{array}$<br>A. Almost one<br>B. More than one<br>C. Less than $\frac{1}{2}$<br>D. None of the above |
| | 3.10.2 Estimate $\begin{array}{r} 3\frac{3}{4} \\ -\ 2\frac{2}{3} \\ \hline \end{array}$ |
| 3.11 Find the difference between two mixed numbers. | 3.11.1 Choose the best answer.<br>$\begin{array}{r} 6\frac{2}{3} \\ -\ 2\frac{5}{6} \\ \hline \end{array}$<br>A. $2\frac{5}{6}$ C. $4\frac{1}{3}$<br>B. $3\frac{5}{6}$ D. $4\frac{1}{2}$ |
| | 3.11.2 Find the difference: $\begin{array}{r} 6\frac{3}{8} \\ -\ 2\frac{5}{6} \\ \hline \end{array}$ |
| 3.12 Multiply two proper and/or improper fractional numbers. | 3.12.1 Choose the best answer.<br>$\frac{3}{4} \times \frac{4}{9}$<br>A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{9}$ D. 3 |
| | 3.12.2 Solve: $1\frac{1}{2} \times 2\frac{3}{5} =$ __________ |

| Objectives | Measures |
|---|---|
| 3.13 Determine the solution to a problem solving situation involving fractional numbers. | 3.13.1 A magician is trying to develop an act for his routine. He will sit on a platform above a tank handcuffed. The platform is controlled by a lock with a fuse that burns at the rate of $\frac{1}{2}$ foot a minute. When it burns to the end, it blows the lock, releases the platform and drops the magician into the water. The magician can get out of the handcuffs in $\frac{3}{4}$ of a minute. How long must the fuse be so that the magician is out of the handcuffs when the platform releases?<br>A. $\frac{3}{4}$ ft.<br>B. $\frac{3}{8}$ ft.<br>C. $\frac{1}{2}$ ft.<br>D. None of the above. |
| | 3.13.2 A turtle traveling from Asheville to Raleigh travels at the rate of $\frac{3}{4}$ miles per hour. How far will he go in $\frac{1}{2}$ hour? |
| 3.14 Determine the reciprocal of a fractional or mixed number. | 3.14.1 The reciprocal of $\frac{3}{7}$ is:<br>A. 37<br>B. 21<br>C. $\frac{7}{3}$<br>D. $\frac{10}{7}$ |
| | 3.14.2 Write the reciprocal of $1\frac{1}{8}$ . |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.15 Find the quotient of two fractional numbers. | 3.15.1 Choose the correct answer.<br>$\frac{4}{15} \div \frac{2}{5}$<br>A. $\frac{2}{3}$ C. $\frac{8}{75}$<br>B. $1\frac{1}{2}$ D. None of the above.<br>3.15.2 Solve:<br>$\frac{3}{4} \div \frac{5}{16} =$ ______________ |
| 3.16 Use $<$, $>$, or $=$ to compare two fractions. | 3.16.1 Use $<$ , $>$ or $=$ to make the statement true.<br>$1\frac{1}{4} \square \frac{6}{3}$<br>A. $<$<br>B. $>$<br>C. $=$<br>D. None of the above<br>3.16.2 Use $<$ , $>$ or $=$ to make the statement true.<br>$\frac{5}{12} \square \frac{1}{2}$ |

MATHEMATICS

Grade Level: 7 Skills/Subject Area: Mathematics

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.1 Read and write decimals. | 4.1.1 0.689 is written as which of the following words?<br>A. Six hundred eighty-nine hundredths<br>B. Six hundred eight-nine<br>C. Six hundred eighty-nine thousands<br>D. Six hundred eighty-nine thousandths<br>4.1.2 Read aloud 0.489 |
| 4.2 Read and write money (dollars and cents) through $10,000. | 4.2.1 $1,454 is written as which of the following in words.<br>A. One thousand four hundred five four dollars<br>B. One thousand four hundred fifty-four dollars<br>C. One thousand four five four dollars<br>D. None of the above<br>4.2.2 Write $789.45 in words. |
| 4.3 Use <, >, or = to compare two decimals. | 4.3.1 Study the decimal numbers below. Which sentence is true?<br>A. .246 < .464<br>B. .246 > 2.46<br>C. .246 = 246<br>D. None of the above<br>4.3.2 Fill in the ☐ with <, > or = to make the sentence true.<br>4.26 ☐ 0.426 |

**COMPETENCY GOAL 4:** The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.4 Round a number less than 10 containing no more than two decimal places to the nearest whole number. | 4.4.1 Rounding 9.46 to the nearest whole number would be:<br>A. 9.4<br>B. 9<br>C. 10<br>D. 9.40<br>4.4.2 Round 8.47 to the nearest whole number. |
| 4.5 Estimate the sum of two or three decimal numbers. | 4.5.1 Estimate the following sum. Choose the correct answer.<br>19.27 + 18.00 + 11.81 =<br>A. 50<br>B. 30<br>C. Less than 30<br>D. More than 50<br>4.5.2 Estimate the following sum.<br>3.146<br>8.215<br>+ 2.791 |
| 4.6 Add three numbers, each having no more than three decimal places. | 4.6.1 Choose the best answer.<br>19.030<br>14.190<br>+25.009<br>A. 58.229<br>B. 582.29<br>C. 5.8229<br>D. None of the above<br>4.6.2 Add: 7.31<br>12.1<br>+13.143 |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.7 Subtract two decimal numbers, each having no more than three decimal places. | 4.7.1 Choose the best answer.<br>979.3 - 0.753 =<br>A. 226.3<br>B. 904.0<br>C. 971.77<br>D. 978.547 |
| | 4.7.2 Subtract the following:<br>$\begin{array}{r} 7.332 \\ \underline{-2.449} \end{array}$ |
| 4.8 Multiply a whole number and a number with no more than three decimal places. | 4.8.1 Choose the correct answer for the following problem.<br>$\begin{array}{r} 650 \\ \underline{\times 8.2} \end{array}$<br>A. 533.33<br>B. 533.0<br>C. 53.30<br>D. 5330 |
| | 4.8.2 Solve:<br>$\begin{array}{r} 489 \\ \underline{\times .76} \end{array}$ |
| 4.9 Multiply two decimal numbers. | 4.9.1 Solve and choose the correct answer.<br>$\begin{array}{r} 0.73 \\ \underline{\times 0.29} \end{array}$<br>A. 21.17<br>B. 0.2117<br>C. 2.117<br>D. 211.7 |
| | 4.9.2 Solve:<br>$\begin{array}{r} 0.076 \\ \underline{\times\ 0.025} \end{array}$ |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | | Measures | |
|---|---|---|---|
| 4.10 | Divide a decimal number (in 10ths, 100ths or 1000ths) by a multiple of 10 less than 100. | 4.10.1 | Solve and choose the best answer.<br>$30\overline{)0.150}$<br>A. 0.5<br>B. 5<br>C. 0.005<br>D. 0.05 |
| | | 4.10.2 | Solve:<br>$70\overline{)0.210}$ |
| 4.11 | Find the quotient of two decimal numbers. | 4.11.1 | Choose the closest answer.<br>$0.19\overline{)0.00345}$<br>A. 0.18<br>B. 0.018<br>C. 1.80<br>D. None of the above |
| | | 4.11.2 | Solve:<br>$8.3\overline{)0.0913}$ |
| 4.12 | Estimate the difference, product or quotient of two decimal numbers. | 4.12.1 | Choose the better estimate:<br>$3.2\overline{)173.4}$<br>A. 5,440<br>B. 54<br>C. 540<br>D. 5.4 |
| | | 4.12.2 | Estimate the product.<br>$\begin{array}{r} 4.84 \\ \underline{\times\ 2.1} \end{array}$ |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.13 Determine equivalent amounts of money using coins and paper currency. | 4.13.1 If you have $2.45 and you are told that you have 13 coins, what are the coins?<br>A. 8 dimes, 4 quarters and 1 nickel<br>B. 8 quarters, 4 dimes and 1 nickel<br>C. 10 dimes, 2 quarters and 1 nickel<br>D. None of the above |
| | 4.13.2 Devise alternative ways of showing:<br>1. $126.50 2. $98.75 |
| 4.14 Find the solution to a problem solving situation involving a purchase totaling less than $10 with change to be made from a $20 bill. | 4.14.1 John bought a pair of hamsters for $7.85. He gave the clerk a $20 bill. How much change did he receive?<br>A. $13.15<br>B. $2.15<br>C. $27.85<br>D. $12.15 |
| | 4.14.2 Joe and Anne went to the movies. Tickets cost $3.75 for each person. If Joe paid for both tickets and gave the attendant a $20 bill to purchase the tickets, how much change did he receive? |
| 4.15 Multiply or divide a money amount by a whole number. | 4.15.1 Choose the correct answer.<br>$7\overline{)\$24.85}$<br>A. $3.45<br>B. $3.16<br>C. $3.55<br>D. $2.55 |
| | 4.15.2 Solve: $\begin{array}{r}\$14.87\\ \times\ 69\\ \hline\end{array}$ |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 4.16 Determine the solution to a real world problem involving comparison shopping for purchases of less than $10.00. | 4.16.1 Johnny is in the grocery store trying to decide the best buy for sugar. A 5 pound bag sells for $1.59, a 10 pound bag for $3.19 and a 20 pound bag for $6.35. Determine the best buy.<br>A. 5 pound bag<br>B. 10 pound bag<br>C. 20 pound bag<br>D. Same for all<br>4.16.2 Sam is considering buying shells for his gun. He wants to make sure that he gets the most for his money. Which is the best buy per shell?<br>A. Twenty shells cost $3.58<br>B. Fifty shells cost $7.50<br>C. Seventy shells cost $9.95<br>D. Same for all |
| 4.17 Write a decimal number as a fraction. | 4.17.1 Change the decimal number 0.4 to a fraction. Choose the best answer.<br>A. $\frac{2}{5}$ C. $\frac{1}{4}$<br>B. $\frac{4}{12}$ D. $\frac{1}{3}$<br>4.17.2 Change the decimal number 0.5 to a fraction.<br>0.5 = ___________ |
| 4.18 Write a fractional number as a decimal. | 4.18.1 The decimal equivalent of $\frac{1}{4}$ is ______________.<br>A. 0.14<br>B. 2.5<br>C. 0.25<br>D. 1.4<br>4.18.2 The decimal equivalent of $\frac{1}{3}$ is ________________. |

## MATHEMATICS

Grade Level: 7 Skills/Subject Area: Mathematics

COMPETENCY GOAL 5: The learner will demonstrate an understanding of ratio, proportion and percent.

| Objectives | Measures |
|---|---|
| 5.1 Express a comparison of two numbers as a ratio. | 5.1.1 Give the ratio in lowest terms.<br>$\frac{24\text{cm}}{72\text{cm}}$<br>A. $\frac{3}{1}$ C. $\frac{4}{1}$<br>B. $\frac{1}{4}$ D. $\frac{1}{3}$ |
| | 5.1.2 Give the ratio in lowest terms.<br>15 to 18 |
| 5.2 Find the missing term of a proportion. | 5.2.1 Choose the correct answer for $\boxed{\phantom{00}}$ in the following proportion.<br>$\frac{5}{8} = \frac{\boxed{\phantom{00}}}{32}$<br>A. 8<br>B. 4<br>C. 20<br>D. 5 |
| | 5.2.2 Solve the following for $\boxed{\phantom{00}}$<br>$\frac{3}{7} = \frac{12}{\boxed{\phantom{00}}}$ |
| 5.3 Explain the meaning of percent as the number of parts per 100. | 5.3.1 The definition of percent is:<br>A. %<br>B. The ratio of a number to another<br>C. The number of parts per 100<br>D. None of the above |
| | 5.3.2 In your own words, explain the meaning of percent. |

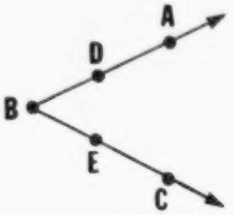
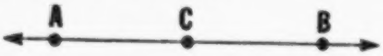
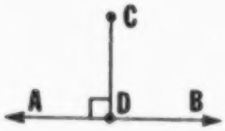
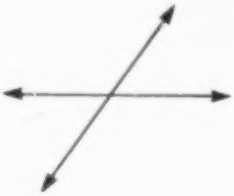
COMPETENCY GOAL 5: The learner will demonstrate an understanding of ratio, proportion and percent.

| | Objectives | | Measures |
|---|---|---|---|
| 5.4 | Change a percent (less than 100%) to a decimal and a decimal to a percent. | 5.4.1 | As a percent, the decimal 0.67 is the same as:<br>A. 0.67 percent<br>B. 6.7 percent<br>C. 67 percent<br>D. 6700 percent |
| | | 5.4.2 | Change 48% to its decimal equivalent.<br>____________________ |
| 5.5 | Identify a decimal or a percent that is equivalent to a proper fraction having 10 or 100 for its denominator. | 5.5.1 | The decimal 0.30 is equivalent to which of the following proper fractions.<br>A. $\frac{1}{3}$ C. $\frac{3}{10}$<br>B. $\frac{30}{1000}$ D. None of these |
| | | 5.5.2 | Write a proper fraction with 100 for its denominator for 75%. |
| 5.6 | Change a fraction into a percent. | 5.6.1 | As a percent, $\frac{3}{5}$ is the same as:<br>A. 30 percent<br>B. 35 percent<br>C. 60 percent<br>D. 167 percent |
| | | 5.6.2 | As a percent, $\frac{1}{4}$ is: ____________. |
| 5.7 | Determine the solution to problem solving situations involving discounts, commissions, tax rates, and simple interest. | 5.7.1 | The principal on a loan was $750, with an interest rate of 5% a year. What was the interest after 1 year?<br>A. $35.50<br>B. $150.00<br>C. $7.45<br>D. Not given |
| | | 5.7.2 | Tom bought a glove for $20.50. If the sales tax is 4 percent, what is the total cost?<br>____________________ |

## MATHEMATICS

Grade Level: 7 Skills/Subject Area: Mathematics

COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes and constructions.

| Objectives | Measures |
|---|---|
| 6.1 Identify such terms as point, line, segment, plane, ray and angle. | 6.1.1 Study the drawing. $\overline{BD}$ is a:<br><br> <br>A. Ray<br>B. Segment<br>C. Line<br>D. Congruent<br><br>6.1.2 Study the drawing:<br><br> <br>$\overrightarrow{BC}$ is classified as a ____________.<br>(Fill in the blank.) |
| 6.2 Classify two lines or segments as being intersecting, parallel, or perpendicular. | 6.2.1<br><br> <br>Line AB is __________ to segment CD.<br>A. Parallel<br>B. Perpendicular<br>C. Equal<br>D. None of the above<br><br>6.2.2 The following lines are classified as what types of lines?<br> |

COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes and constructions.

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Objectives | Measures

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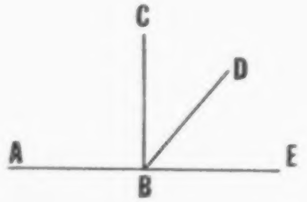
6.3 Identify acute, right, and obtuse angles.

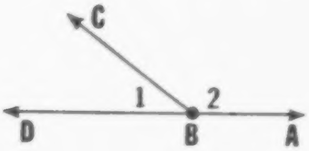
6.3.1



Which angle is a right angle in the drawing above?

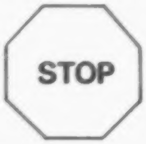
A. ∠ ABD
B. ∠ DBE
C. ∠ ABE
D. ∠ CBE

6.3.2 Study the figure. Which angle is obtuse?



6.4 Identify a polygon with no more than eight sides.

6.4.1 The polygon below is a __________.



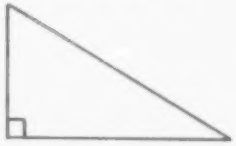
A. Hexagon
B. Octagon
C. Heptagon
D. Square

6.4.2 A polygon with five (5) sides is

a ________________.

6.5 Classify triangles by the size of their angles or by the number of congruent sides.

6.5.1 Study the drawing. What type of triangle is this?



A. Obtuse triangle
B. Acute triangle
C. Right triangle
D. Congruent triangle

6.5.2 Draw an equiangular triangle.

COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes and constructions.

| Objectives | Measures |
|---|---|

6.6 Classify quadrilaterals, given information about their sides and angles.

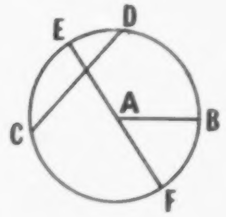
6.6.1 If a quadrilateral has four congruent sides, it must be a ________________.

A. Rectangle
B. Square
C. Parallelogram
D. Any of the above

6.6.2 Draw a quadrilateral with two congruent angles and give its name.

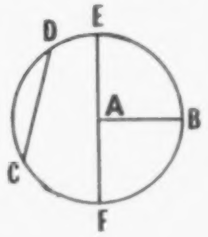
6.7 Identify the parts of a circle: center, radius, diameter, circumference, and chord.

6.7.1 Study the circle below. $\overline{AB}$ is the



A. Diameter
B. Chord
C. Center
D. Radius

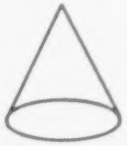
6.7.2 Study the circle. Identify a radius.



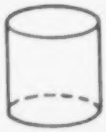
6.8 Identify such space figures (solids) as the cube, rectangular solid, (box), cylinder, sphere, and cone.

6.8.1 What is this solid called?

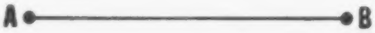
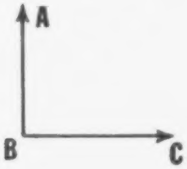
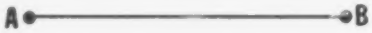
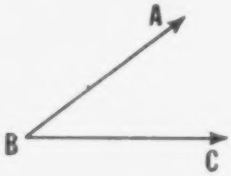
A. A cone
B. A sphere
C. A prism
D. A cylinder



6.8.2 What is this solid called?



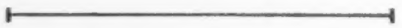
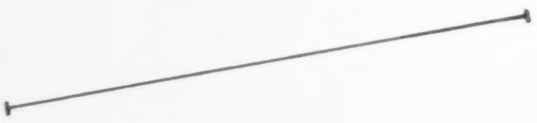
COMPETENCY GOAL 6: The learner will demonstrate an understanding of geometric shapes and constructions.

| Objectives | Measures |
|---|---|
| 6.9 Use a compass and straight edge to copy a segment, angle or triangle. | 6.9.1 Use a compass and straight edge to copy this segment.<br><br> |
| | 6.9.2 Copy the following angle using a compass and straight edge.<br><br> |
| 6.10 Use a compass and straight edge to bisect a segment or angle. | 6.10.1 Use a compass and straight edge to bisect this segment.<br><br> |
| | 6.10.2 Use a compass and straight edge to bisect this angle.<br><br> |

# MATHEMATICS

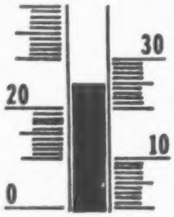
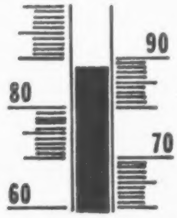
Grade Level: 7 Skills/Subject Area: Mathematics

COMPETENCY GOAL 7: The learner will do some measurement activities and solve related problems.

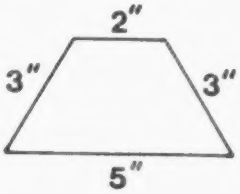
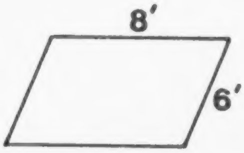
| Objectives | Measures |
|---|---|
| 7.1 Determine the difference between two times. | 7.1.1 Kevin fell asleep at 10:40 p.m. and woke up the next morning at 7:10 a.m. How long did Kevin sleep?<br>A. 7 hours 40 minutes<br>B. 8 hours 30 minutes<br>C. 8 hours 10 minutes<br>D. 8 hours 20 minutes |
| | 7.1.2 A plane leaves at 11:15 a.m. and arrives at its destination in the same time zone at 3:05 p.m. How long was the flight? |
| 7.2 Determine length, width, or height by measuring an object or drawing to the nearest centimeter, meter or appropriate customary unit. | 7.2.1 Determine the length of the segment to the nearest one-half centimeter.<br><br>A. 4.5 cm<br>B. 6.0 cm<br>C. 5.0 cm<br>D. 5.5 cm |
| | 7.2.2 Determine the length of the segment.<br> |
| 7.3 Determine capacity by measuring quantities of liquids in metric cups or liters, or appropriate customary unit. | 7.3.1 Sam drank 0.5 liter of lemonade. How many milliliters is this?<br>a) 500 mL b) 0.005 mL<br>c) 50 mL d) 0.5 mL |
| | 7.3.2 Use a 50 mL beaker full of water to determine how many tablespoons are contained in the beaker. |

Skills/Subject Area: Mathematics 7 Page 2

COMPETENCY GOAL 7: The learner will do some measurement activities and solve related problems.

| Objectives | Measures |
|---|---|
| 7.4 **Determine the mass (weight) of an object by measuring or computing to the nearest gram, kilogram or appropriate customary unit.** | 7.4.1 Which is best for finding the mass of a small dog?<br>A. mg<br>B. g<br>C. kg<br>D. t<br>7.4.2 Use a set of metric mass pieces to determine the mass of an orange. |
| 7.5 Determine temperature by reading a thermometer. | 7.5.1 Study the thermometer and circle the correct temperature.<br>A. 30°<br>B. 25°<br>C. 35°<br>D. 15°<br> <br>7.5.2 Study the thermometer and record the temperature.<br> |
| 7.6 Solve a problem involving linear measurement with centimeters, meters, or appropriate customary units requiring addition or subtraction with no conversion. | 7.6.1 How many feet of wooden molding are needed for a bedroom floor 11 feet 6 inches by 12 feet 8 inches?<br>A. 36 feet<br>B. 23 feet 14 inches<br>C. 48 feet 4 inches<br>D. Not Given<br>7.6.2 A floor is constructed of 17 boards each 48 inches wide. How wide is the floor? |

COMPETENCY GOAL 7: The learner will do some measurement activities and solve related problems.

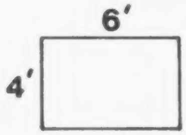
| Objectives | Measures |
|---|---|
| 7.7 Solve a problem involving capacity (liquid measure) requiring liters or appropriate customary units. | 7.7.1 A recipe for pancakes calls for $\frac{1}{4}$ quart of milk. How many quarts are needed to halve the recipe?<br>A. $\frac{1}{2}$ C. $\frac{1}{8}$<br>B. $\frac{1}{4}$ D. $\frac{1}{16}$<br>7.7.2 If you can get 16 glasses of cola from a 2 liter cola and 30 children need to be served, how many liters of cola are needed? |
| 7.8 Solve a mass (weight) problem with grams, kilograms, or appropriate customary units. | 7.8.1 How many 3 oz. boxes of cookies can be made from a 9 lb. box of cookies?<br>A. 36<br>B. 40<br>C. 44<br>D. 48<br>7.8.2 Meredith takes an iron tablet everyday. Each tablet contains 63 mg of iron. How many mg of iron does she take in a week? |
| 7.9 Find the perimeter of a simple polygon. | 7.9.1 What is the perimeter of this figure?<br>A. 90 in.<br>B. 30 in.<br>C. 21 in.<br>D. 13 in.<br><br> <br>7.9.2 What is the perimeter of this parallelogram?<br><br> |

COMPETENCY GOAL 7: The learner will do some measurement activities and solve related problems.

Objectives Measures

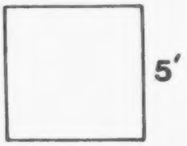
7.10 Determine the areas of geometric regions.

7.10.1 What is the area of this rectangle?



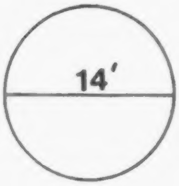
A. 24 sq. ft.
B. 20 ft.
C. 20 sq. ft.
D. Not given

7.10.2 What is the area of this square?



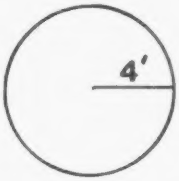
7.11 Determine the area of a circle.

7.11.1 What is the area of this circle?



A. 154 sq. ft.
B. 145 sq. ft.
C. 140 sq. ft.
D. 616 sq. ft.

7.11.2 What is the area of the circle?



MATHEMATICS

Grade Level: 7 Skills/Subject Area: Mathematics

COMPETENCY GOAL 8: The learner will demonstrate an understanding of graphs, tables, maps, and statistics.

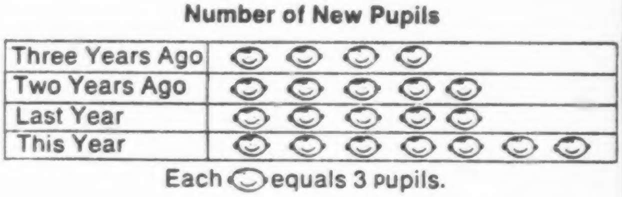
| Objectives | Measures |
|---|---|
| 8.1 Collect data or take data already collected and record it in a table, chart, or graph. | 8.1.1 Make a bar graph from the information given below. |

| Name | No. of Points Scored |
|---|---|
| Carmen | 11 |
| Georgia | 13 |
| Miriam | 6 |
| Theresa | 8 |
| Naomi | 10 |
| Pamela | 4 |

8.1.2 Have students measure the height of each person in class and construct a chart to show the results.

COMPETENCY GOAL 8: The learner will demonstrate an understanding of graphs, tables, maps, and statistics.

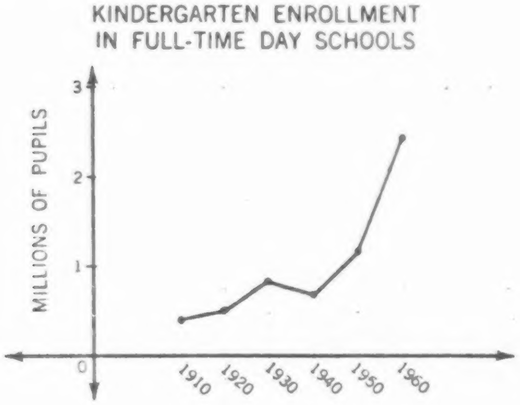
| Objectives | Measures |
|---|---|
| 8.2 Interpret information contained in tables, charts, and diagrams. | 8.2.1 This chart shows the number of new pupils who came to our school this year and in other years. |



How many new pupils came to our school two years ago?

A. 15
B. 8
C. 5
D. 12

8.2.2 Study the graph. In what year was there approximately one (1) million students?

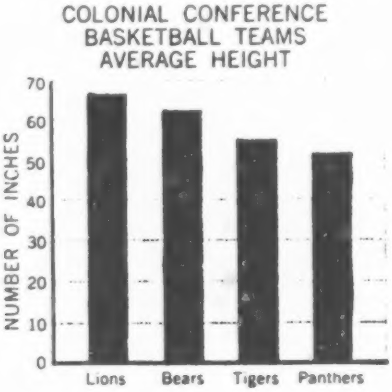


COMPETENCY GOAL 8: The learner will demonstrate an understanding of graphs, tables, maps, and statistics.

**Objectives** | **Measures**

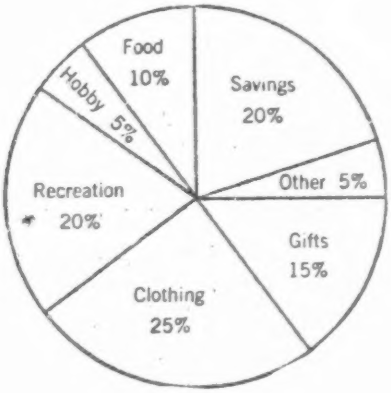
8.3 Interpret bar, circle, broken line, and picture graph.

8.3.1 Study the bar graph below. Which team has the tallest ball player?



A. Lions
B. Bears
C. Tigers
D. Not able to tell from graph

8.3.2 Study the graph. What % of the yearly salary shown in this graph is put into savings?



COMPETENCY GOAL 8: The learner will demonstrate an understanding of graphs, tables, maps, and statistics.

**Objectives** — **Measures**

8.4 Locate a place on a highway map by using the coordinate system.

8.4.1 Examine an official N.C. Highway map and determine what city in N.C. would be found at the coordinates of

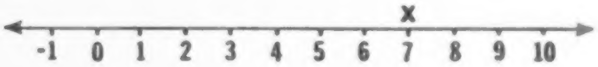
$\boxed{\text{H, 1.5}}$

A. Asheboro
B. Chapel Hill
C. Durham
D. Raleigh

8.4.2 Use the N.C. Highway map and give the coordinates for Gastonia, N.C.

8.5 Locate points (including integers) on a number line.

8.5.1 Study the number line and choose the number where (x) is located.



A. 8
B. 6
C. 7
D. 5

8.5.2 Draw a number line to show the number location of 9 on the number line.

8.6 Determine the mean, median, and mode from data which is given.

8.6.1 Find the mean of 96, 86, 93, 86, 94.

A. 91
B. 455
C. 86
D. 93

8.6.2 What is the mode of 96, 86, 93, 86, 94?

MATHEMATICS

Grade Level: 7 Skills/Subject Area: Mathematics

COMPETENCY GOAL 9: The learner will demonstrate an understanding of integers.

| Objectives | Measures |
|---|---|
| 9.1 Use **<**, **>** or **=** to compare two integers. | 9.1.1 Choose the correct symbol to fill in the expression.<br>-1 ☐ -2<br>A. **>**<br>B. **<**<br>C. **=**<br>D. None of the above |
| | 9.1.2 Compare the following integers using **<** or **>** .<br>-12 ☐ 0 |
| 9.2 Arrange several integers in increasing or decreasing order. | 9.2.1 Choose the correct answer. Place the following integers in decreasing order.<br>+ 6, + 2, -2, - 1<br>A. -2, -1, +2, +6<br>B. +6, +2, -2, -1<br>C. +6, +2, -1, -2<br>D. None of the above |
| | 9.2.2 Place the following integers in increasing order.<br>+ 6, + 12, 0, - 4, + 1, - 6 |
| 9.3 Name the additive inverse (opposite) of an integer. | 9.3.1 Choose the correct additive inverse for +12.<br>A. 12<br>B. -12<br>C. 1.2<br>D. 21 |
| | 9.3.2 The additive inverse for -18 is<br>______________. |

Skills/Subject Area: Mathematics 7 Page 2

COMPETENCY GOAL 9: The learner will demonstrate an understanding of integers.

| Objectives | Measures |
|---|---|
| 9.4 Add integers. | 9.4.1 Add and choose the correct answer.<br>(-14) + (+3) = ☐<br>A. -10<br>B. -11<br>C. +11<br>D. None of the above |
| | 9.4.2 Add the following:<br>-48 + (16) = ☐ |
| 9.5 Subtract integers. | 9.5.1 Subtract and choose the correct answer.<br>(5) - (-2) = ☐<br>A. -3<br>B. -7<br>C. 7<br>D. 3 |
| | 9.5.2 Subtract the following:<br>57 - (64) = ☐ |

## Grade 8 Outline

1. Numeration
    - a. Round a whole number to a designated place.
    - b. Write numbers using scientific notation.

2. Whole Numbers
    - a. Add, subtract, multiply, and divide.
    - b. Estimate sums, differences, products, and quotients.
    - c. Raise a number to a given power.
    - d. Identify and use number properties.
    - e. Use correct order of operations.
    - f. Solve problems.

3. Fractions
    - a. Read and write.
    - b. Compare two fractions.
    - c. Add, subtract, multiply, and divide.
    - d. Estimate sums, differences, products, and quotients.
    - e. Solve problems.

4. Decimals
    - a. Read and write.
    - b. Arrange in ascending or descending order.
    - c. Round a decimal to a designated place.
    - d. Add, subtract, multiply, and divide.
    - e. Estimate sums, differences, products, and quotients.
    - f. Multiply and divide by powers of ten.
    - g. Solve problems.

5. Ratio, Proportion, and Percent
    - a. Find the missing term of a proportion.
    - b. Write fraction, decimal, and percent equivalents.
    - c. Find the percent of a given number.
    - d. Find a number when a percent of it is given.
    - e. Find what percent one number is of another.
    - f. Solve problems.

6. Geometry
    - a. Classify geometric figures.
    - b. Identify similar and congruent figures and their corresponding parts.
    - c. Describe space figures.

d. Use a compass and straight edge to copy geometric figures and their parts.
e. Solve problems.

7. Measurement

   a. Determine the difference between two times.
   b. Determine the length, width, or height of objects using customary and metric units.
   c. Determine capacity using customary and metric units.
   d. Determine mass using customary and metric units.
   e. Read and record temperatures using Celsius and Fahrenheit scales.
   f. Find the perimeter and area of geometric figures, including the circumference of a circle.
   g. Find the volume and surface area of geometric figures.
   h. Solve problems.

8. Probability and Statistics

   a. Construct, read, and interpret graphs and charts.
   b. Compute distances using map scales.
   c. Graph on a number line.
   d. Identify and locate ordered pairs on a grid.
   e. Determine the mean, median, and mode of a set of data.
   f. Solve problems.

9. Integers

   a. Compare two integers.
   b. Arrange several integers in increasing and decreasing order.
   c. Find the absolute value of an integer.
   d. Name the additive inverse of a given integer.
   e. Add, subtract, multiply, and divide.
   f. Solve problems.

10. Real Numbers

   a. Find the square root of a number using a table, calculator, or algorithm.
   b. Use the Pythagorean Theorem to find the missing side of a right triangle.
   c. Solve problems.

11. Algebra

   a. Read and write simple algebraic expressions.
   b. Determine variables in an equation.
   c. Express basic mathematical and scientific principles as formulas.
   d. Find values of algebraic expressions.
   e. Find the solution to a simple linear equation or inequality.
   f. Solve problems.

## MATHEMATICS

Grade Level: 8 Skills/Subject Area: Mathematics

COMPETENCY GOAL 1: The learner will demonstrate an understanding of whole numbers and operations involving them.

| Objectives | Measures |
|---|---|
| 1.1 Round numbers to any designated place. | 1.1.1 Round 12,209,125 to the nearest thousand. Choose the best answer.<br>A. 12,209,000<br>B. 12,209,100<br>C. 12,200,000<br>D. None of the above<br>1.1.2 Round 484,684,789 to the nearest hundred thousand. |
| 1.2 Use rounding skills to estimate the answer to +, -, x, or ÷ problem. | 1.2.1 Round to the nearest ten thousand. Estimate the sum.<br>21,370 A. 100,000<br>72,234 B. 150,000<br>54,630 C. 160,000<br>+18,698 D. 200,000<br>1.2.2 Round to the nearest ten thousand to estimate the sum.<br>91,778<br>+ 46,119 |
| 1.3 Add, subtract, multiply and divide whole numbers in problem solving situations. | 1.3.1 Choose the best answer:<br>An airplane flies non-stop from Chicago to Hong Kong, an air distance of about 13,080 kilometers in 12 hours. What speed did the airplane average for the trip.<br>A. 55 km/h C. 109 km/h<br>B. 1090 km/h D. 10900 km/h<br>1.3.2 Henrietta bought 15 radios at $32.00 each, 12 irons at $16.00 each, 24 toasters at $8 each and 10 blenders at $20.00 each. What was the total cost of the irons? |

COMPETENCY GOAL 1: The learner will demonstrate an understanding of whole numbers and operations involving them.

| | Objectives | | Measures |
|---|---|---|---|
| 1.4 | Use the "order of operations" to determine the value of an expression. | 1.4.1 | Compute: $8 + 6 \cdot 8$<br>A. 14.8<br>B. 112<br>C. 56<br>D. None of the above |
| | | 1.4.2 | Compute: $28 - 1 \cdot 8 - 11$ |
| 1.5 | Raise a number to a given power. | 1.5.1 | Find the value of $5^4$.<br>A. 1024<br>B. 50<br>C. 20<br>D. 625 |
| | | 1.5.2 | Find the value of $6^3$. |
| 1.6 | Express a product in its exponential form, e.g., $125 = 5^3$ or $100 = 10^2$. | 1.6.1 | Express 32 as a power of 2.<br>A. $2^6$<br>B. $2^5$<br>C. $2^4$<br>D. $2^3$ |
| | | 1.6.2 | Express 256 as a power of 4. |
| 1.7 | Use scientific notation to represent whole numbers. | 1.7.1 | Express 4,860,000,000 in scientific notation.<br>A. $486^{10}$<br>B. $486^7$<br>C. $4.86 \times 10^9$<br>D. $48.60^{10}$ |
| | | 1.7.2 | Express 3,750,000,000 in scientific notation. |

COMPETENCY GOAL 1: The learner will demonstrate an understanding of whole numbers and operations involving them.

| Objectives | Measures |
|---|---|
| 1.8 Simplify an example containing a power of a power<br>e.g., $(5^2)^3 = 5^6$, or the power of a product, e.g., $(5 \times 3)^2 = 15^2$. | 1.8.1 Simplify: $(25^2)^4$<br>A. $(5 \times 5)^6$<br>B. $25^8$<br>C. $(5 \times 1)^2 \times (5 \times 5)^4$<br>D. None of the above |
| | 1.8.2 Simplify: $(5 \times 3)^2$ |
| 1.9 Find the GCF (greatest common factor) of two or more whole numbers. | 1.9.1 What is the greatest common factor of 64, 192, and 240?<br>A. 64<br>B. 32<br>C. 8<br>D. 16 |
| | 1.9.2 What is the greatest common factor of 20 and 30? |
| 1.10 Determine the LCM (least common multiple) of two or more whole numbers. | 1.10.1 Find the least common multiple of 8, 12, 18.<br>A. 24<br>B. 2<br>C. 72<br>D. 18 |
| | 1.10.2 Find the least common multiple of 5, 6, 10. |
| 1.11 Identify the Commutative Property of Addition from among several examples and explain its meaning. | 1.11.1 Circle the example which shows the Commutative Property of Addition.<br>A. $a + b = ab$<br>B. $aa + bb = 2a + 2b$<br>C. $a + a = b + b$<br>D. $a + b = b + a$ |
| | 1.11.2 Explain in your own words and/or give an example of the Commutative Property of Addition. |

**COMPETENCY GOAL 1:** The learner will demonstrate an understanding of whole numbers and operations involving them.

| Objectives | | Measures | |
|---|---|---|---|
| 1.12 | Identify the Associative Property of Addition from among several examples and explain its meaning. | 1.12.1 | Circle the example which shows the Associative Property of Addition.<br>A. $(a + b) + c = a + (b + c)$<br>B. $a + b + c = c + b + a$<br>C. $abc = cba$<br>D. None of the above |
| | | 1.12.2 | Explain in your own words and/or give an example of the Associative Property of Addition. |
| 1.13 | Identify the Commutative Property of Multiplication from among several examples and explain its meaning. | 1.13.1 | Circle the example that shows the Commutative Property of Multiplication.<br>A. $a \cdot b = a \cdot a$<br>B. $a \cdot b + b \cdot a$<br>C. $aa \cdot bb = a^2 + b^2$<br>D. None of the above |
| | | 1.13.2 | Explain in your own words and/or give an example of the Commutative Property of Multiplication. |
| 1.14 | Identify the Associative Property of Multiplication from among several examples and explain its meaning. | 1.14.1 | Circle the example that shows the Associative Property of Multiplication.<br>A. $a + b (b \cdot c) = (a + b) + c$<br>B. $a \cdot (b \cdot c) = (a \cdot b) \cdot c$<br>C. $a \cdot (b + c) = (a \cdot b) + c$<br>D. None of the above |
| | | 1.14.2 | Explain in your own words and/or give an example of the Associative Property of Multiplication. |

**COMPETENCY GOAL 1:** The learner will demonstrate an understanding of whole numbers and operations involving them.

| Objectives | Measures |
|---|---|
| 1.15 Identify the Distributive Property of Multiplication over Addition from among several examples and explain its meaning. | 1.15.1 Circle the example that shows the Distributive Property of Multiplication over Addition.<br>A. $a \cdot (b + c) = a \cdot b + a \cdot c$<br>B. $a \cdot (b + c) = ab \cdot ac$<br>C. $a \cdot (b + c) = a^2 + c^2$<br>D. None of the above |
| | 1.15.2 Explain in your own words and/or give an example of the Distributive Property of Multiplication over Addition. |
| 1.16 Identify the Property of Zero for Addition from among several choices and explain its meaning. | 1.16.1 Circle the example that shows the Property of Zero for Addition.<br>A. $a^2 + 0^2 = a0^2$<br>B. $a + 0 = a$ and $0 + a = a$<br>C. $a + 0 = 0$<br>D. $a + 0 = a \cdot 0$ |
| | 1.16.2 Explain in your own words and/or give an example of the Property of Zero for Addition. |
| 1.17 Identify the Property of One for Multiplication from among several choices and explain its meaning. | 1.17.1 Circle the example that shows the Property of One for Multiplication.<br>A. $N = 1 + 1$<br>B. $1 = N$<br>C. $N \cdot N = 1$<br>D. $1 \cdot N = N$ and $N \cdot 1 = N$ |
| | 1.17.2 Explain in your own words and/or give an example of the Property of One for Multiplication. |

MATHEMATICS

Grade Level: 8 Skills/Subject Area: Mathematics

COMPETENCY GOAL 2: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 2.1 Read and/or write numbers with as many as four decimal places. | 2.1.1 Write 29.085 in words. Choose the correct answer.<br>A. Twenty-nine & zero eighty-five thousand<br>B. Twenty-nine & zero eighty-five<br>C. Twenty-nine & eighty-five thousand<br>D. Twenty-nine & eighty-five thousandths |
| | 2.1.2 Read the numeral 484.0635 and write it in words. |
| 2.2 Arrange two or more decimal numbers in ascending or descending order. | 2.2.1 When listed in order from greatest to smallest, which number would be first?<br>A. 36.845<br>B. 36.485<br>C. 36.854<br>D. 36.584 |
| | 2.2.2 Arrange the following decimal numbers in order from smallest to largest.<br>42.684; 42.846; 42.468; 42.648 |
| 2.3 Round decimal numbers to the nearest whole number, tenth, hundredth, or thousandth. | 2.3.1 Round 72.568 to the nearest tenth.<br>A. 72.5<br>B. 72.6<br>C. 72.0<br>D. 72.57 |
| | 2.3.2 Round 484.6754 to the nearest hundredth. |

COMPETENCY GOAL 2: The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 2.4 Add decimal numbers. | 2.4.1 Add: 56.1, 0.253 and 1.96<br>A. 58.313 B. 58.303<br>C. 58.323 D. None of the above |
| | 2.4.2 Add: 486.3 + 2.4168 + 0.0012 + 1.0910 |
| 2.5 Find the difference between two decimal numbers. | 2.5.1 Subtract: 96.431<br>-75.912<br>A. 21.511<br>B. 20.519<br>C. 215.21<br>D. None of the above |
| | 2.5.2 Subtract: 486.031<br>- 29.961 |
| 2.6 Estimate sums and differences involving decimal numbers. | 2.6.1 Estimate the difference. Round to the nearest tenth. 0.77 - 0.34<br>A. 0.400<br>B. 0.708<br>C. 0.700<br>D. 1.0 |
| | 2.6.2 Estimate the difference. Round to the nearest tenth.<br>0.8 - 0.425 |
| 2.7 Multiply a decimal number by 10, 100, and other powers of ten. | 2.7.1 Multiply: 80.15<br>x1000<br>A. 80.15000<br>B. 8,015<br>C. 80,150<br>D. 801,500 |
| | 2.7.2 Multiply: 0.05<br>x 100 |

**COMPETENCY GOAL 2:** The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| 2.8 Multiply two decimal numbers. | 2.8.1 Multiply: $\begin{array}{r} 0.05 \\ \underline{\times 0.01} \end{array}$<br>A. 0.005<br>B. 0.05<br>C. 0.0005<br>D. None of the above |
| | 2.8.2 Multiply: $\begin{array}{r} 0.0014 \\ \underline{\times\ \ 3.06} \end{array}$ |
| 2.9 Divide a decimal number by a one-digit whole number. | 2.9.1 Divide: $0.4907 \div 7$<br>A. 0.00701<br>B. 0.701<br>C. 0.0701<br>D. 0.71 |
| | 2.9.2 Divide: $9\overline{)8.109}$ |
| 2.10 Find the quotient of two decimal numbers. | 2.10.1 Divide: $2.1\ \overline{)24.78}$<br>A. 0.118<br>B. 1.18<br>C. 118<br>D. 11.8 |
| | 2.10.2 Divide: $5.2\ \overline{)91.52}$ |

**COMPETENCY GOAL 2:** The learner will demonstrate an understanding of decimals and their applications.

| Objectives | Measures |
|---|---|
| **2.11 Estimate products and quotients involving decimals.** | 2.11.1 Estimate: Round to the nearest whole number.<br>$51.92\overline{)695}$<br>A. Over 1000<br>B. About 100<br>C. Less than 10<br>D. About 14<br>2.11.2 Estimate: Round to the nearest whole number.<br>$\begin{array}{r} 25.12 \\ \underline{\times\ 0.75} \end{array}$ |
| **2.12 Determine the solution of a real world problem involving a purchase and the change to be received.** | 2.12.1 If a purchase is $11.46, the change from a $20 bill should be:<br>A. $8.64<br>B. $8.54<br>C. $9.54<br>D. $9.64<br>2.12.2 Phyllis purchased the following items:<br>1 ball $4.65<br>1 pair socks $1.95<br>1 set sweat bands $2.63<br>If she gave the clerk $20.00 what is her change? Disregard tax. |

MATHEMATICS

**Grade Level:** 8 Skills/Subject Area: Mathematics

**COMPETENCY GOAL 3:** The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.1 Read and write fractions. | 3.1.1 Written in words $\frac{4}{5}$ would be:<br>A. Four divide five<br>B. Four-fifths<br>C. Five divided by four<br>D. None of the above<br>3.1.2 Write $\frac{2}{8}$ in words. |
| 3.2 Identify proper fractions that are equivalent. | 3.2.1 Circle the fraction below which is not equivalent to $\frac{3}{5}$.<br>A. $\frac{6}{10}$ B. $\frac{15}{5}$<br>C. $\frac{9}{15}$ D. None of the above<br>3.2.2 Change $\frac{3}{16}$ to 32nds. |
| 3.3 Convert improper fractions into mixed numbers and vice versa. | 3.3.1 Change $\frac{15}{6}$ to a mixed number.<br>A. $2\frac{1}{2}$ B. $3\frac{3}{6}$<br>C. $\frac{6}{15}$ D. $1\frac{5}{6}$<br>3.3.2 Change $4\frac{3}{8}$ to an improper fraction. |
| 3.4 Add two or more fractions or mixed numbers. | 3.4.1 Add: $2\frac{4}{5} + \frac{3}{4}$<br>A. $2\frac{7}{20}$ B. $2\frac{12}{20}$<br>C. $2\frac{7}{9}$ D. $3\frac{11}{20}$<br>3.4.2 Add: $5\frac{1}{2} + \frac{7}{10} + 3\frac{3}{5}$ |

COMPETENCY GOAL 3: The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.5 Subtract two fractions or mixed numbers. | 3.5.1 Subtract: $\frac{11}{12} - \frac{1}{3}$<br>A. $\frac{12}{17}$ B. $\frac{9}{6}$<br>C. $\frac{10}{19}$ D. $\frac{7}{12}$<br>3.5.2 Subtract: $\begin{array}{r} 10 \\ -\ 3\frac{2}{5} \\ \hline \end{array}$ |
| 3.6 Estimate the sum or difference of two fractions. | 3.6.1 Estimate the sum: $5\frac{1}{2} + \frac{7}{10} + 3\frac{3}{5}$<br>A. About 1<br>B. Less than 1<br>C. Between 1 and 10<br>D. Greater than 10<br>3.6.2 Estimate the sum:<br>$9\frac{2}{15} + 4\frac{1}{5} + 2\frac{7}{10}$ |
| 3.7 Convert fractions into decimal numbers. | 3.7.1 Convert $\frac{3}{8}$ to a decimal number.<br>A. 0.37<br>B. 0.38<br>C. 0.375<br>D. None of the above<br>3.7.2 Convert $\frac{21}{25}$ to a decimal number. |
| 3.8 Convert decimal numbers into fractions or mixed numbers. | 3.8.1 Convert 0.4 to a fraction.<br>A. $\frac{1}{2}$ B. $\frac{2}{5}$<br>C. $\frac{4}{100}$ D. None of the above<br>3.8.2 Convert 2.75 to a mixed number. |

**COMPETENCY GOAL 3:** The learner will demonstrate an understanding of fractions and their applications.

| Objectives | Measures |
|---|---|
| 3.9 Use <, >, or = to compare two fractions. | 3.9.1 Circle the true statement.<br>A. $\frac{4}{5} > \frac{3}{4}$ B. $\frac{4}{5} < \frac{3}{4}$<br>C. $\frac{4}{5} = \frac{3}{4}$ D. $\frac{4}{5} \leq \frac{3}{4}$<br>3.9.2 Compare the two fractions.<br>$\frac{3}{5} \boxed{\phantom{00}} \frac{2}{3}$ |
| 3.10 Multiply two fractions as mixed numbers. | 3.10.1 Multiply: $6\frac{3}{4} \times 4\frac{4}{5}$<br>A. 31 B. $24\frac{7}{20}$<br>C. $32\frac{2}{5}$ D. $24\frac{12}{20}$<br>3.10.2 Multiply: $1\frac{1}{8} \times \frac{3}{7}$ |
| 3.11 Find the quotient of two fractions. | 3.11.1 Divide: $4\frac{1}{6} \div \frac{5}{9}$<br>A. $7\frac{1}{2}$ B. 3<br>C. $2\frac{17}{54}$ D. 15<br>3.11.2 Divide: $2\frac{1}{8} \div 4\frac{1}{2}$ |

## MATHEMATICS

**Grade Level: 8** Skills/Subject Area: Mathematics

**COMPETENCY GOAL 4:** The learner will demonstrate an understanding of ratio, proportion, and percent.

| Objectives | Measures |
|---|---|
| 4.1 Write a fraction to express the ratio between two quantities. | 4.1.1 The fraction $\frac{3}{5}$ can be written as which of the following ratios:<br>A. 3 out of 5 parts<br>B. 3 x 5<br>C. 3.5 of 1 part<br>D. 5 out of 3 parts |
| | 4.1.2 Find the batting average:<br>125 hits in 435 times at bat |
| 4.2 Find the missing term of a proportion. | 4.2.1 Solve the proportion for x:<br>$\frac{x}{20} = \frac{2}{5}$<br>A. 10 B. 50<br>C. 4 D. 8 |
| | 4.2.2 Solve the proportion for x:<br>$\frac{5}{6} = \frac{20}{x}$ |
| 4.3 Write fraction, decimal and percent equivalents. | 4.3.1 The decimal equivalent of 45% is:<br>A. 45 B. 4.5<br>C. 0.045 D. 0.45 |
| | 4.3.2 Write the fraction and decimal equivalents for $33\frac{1}{3}$ %. |
| 4.4 Find a percent of a given number, e.g., a% of b = ☐. | 4.4.1 Find 8% of 50.<br>A. 5 B. 400<br>C. 4 D. 40 |
| | 4.4.2 Find 175% of 320. |

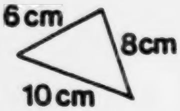
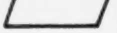
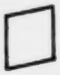
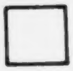
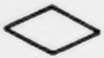
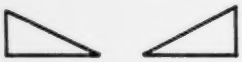
**COMPETENCY GOAL 4:** The learner will demonstrate an understanding of ratio, proportion, and percent.

| Objectives | Measures |
|---|---|
| 4.5 Find a number when a percent of it is given, e.g., C% of ☐ = d. | 4.5.1 45% of x = 135; x =<br>A. 100<br>B. 200<br>C. 300<br>D. 400<br>4.5.2 3% of x = 138; x = ____________ |
| 4.6 Find what percent one number is of another, e.g., ☐ % of e = f. | 4.6.1 Find what percent 15 is of 50.<br>A. $33\frac{1}{3}$ %<br>B. 30%<br>C. 50%<br>D. 20%<br>4.6.2 Find what percent 100 is of 50. |
| 4.7 Determine the solutions to real world problems involving discounts, commissions, tax, and simple interest. | 4.7.1 A golf shop offers a 35% reduction on all golf clubs. How much would you pay for a club which regularly sells for $32?<br>A. $112.00 B. $2.80<br>C. $11.20 D. $20.80<br>4.7.2 What is the selling price of a watch that cost the store $50 if the rate of markup is 40%? |
| 4.8 Compute percent of increase or decrease from real world examples. | 4.8.1 Find the rate of reduction allowed when a pair of shoes that regularly sells for $75 can be purchased for $60.<br>A. 15% B. 20%<br>C. 25% D. 2%<br>4.8.2 Phyllis bought a picture for $96. If the picture usually costs $120, what is the percent of decrease? |

MATHEMATICS

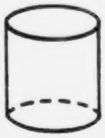
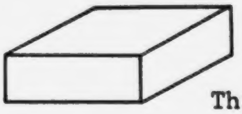
Grade Level: 8 Skills/Subject Area: Mathematics

COMPETENCY GOAL 5: The learner will demonstrate an understanding of geometric shapes and constructions.

| Objectives | Measures |
|---|---|
| 5.1 Classify and/or draw triangles according to the measure of sides or angles. | 5.1.1 Study the following triangle<br><br> <br>What type of triangle do we have?<br>A. Right<br>B. Equilateral<br>C. Scalene<br>D. Isosceles<br>5.1.2 Draw a triangle that has 60° in each angle. |
| 5.2 Classify quadrilaterals according to the measure of sides and angles. | 5.2.1 If a quadrilateral has one right angle and two pairs of parallel sides it is a:<br>A. Rectangle<br>B. Square<br>C. Parallelogram<br>D. Pentagon<br>5.2.2 Draw a quadrilateral which has at least one right angle and two pairs of parallel sides. |
| 5.3 Identify similar and congruent figures and name the corresponding parts. | 5.3.1 Which figure is congruent to:  ?<br>A. <br>C. <br>B. <br>D. Not given<br>5.3.2 Are the two figures similar?<br> |

Skills/Subject Area: Mathematics 8

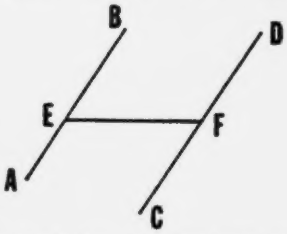
COMPETENCY GOAL 5: The learner will demonstrate an understanding of geometric shapes and constructions.

| Objectives | Measures |
|---|---|
| **5.4 Name and describe such figures as the right circular cylinder, rectangular prism (box), triangular prism, sphere, cone, and pyramid.** | 5.4.1 The figure to the right is a:<br>A. Rectangle<br>B. Circle<br>C. Cone<br>D. Cylinder<br><br>5.4.2 <br>This figure can best be described as a _________. |
| **5.5 Use a compass and straight edge to construct a segment, angle, triangle, or other geometric figure.** | 5.5.1 Construct a regular hexagon with each side measuring 29 millimeters.<br>5.5.2 Draw with a protractor an angle of 67°. Then construct with a compass an angle congruent to it. |
| **5.6 Use a compass and straight edge to bisect a segment and an angle.** | 5.6.1 Draw a 4" segment. Use a compass and straight edge to bisect the segment.<br>5.6.2 Draw an angle measuring 130°. Bisect it using a compass and a straight edge. |

MATHEMATICS

Grade Level: 8 Skills/Subject Area: Mathematics

COMPETENCY GOAL 6: The learner will do some measurement activities and solve related problems.

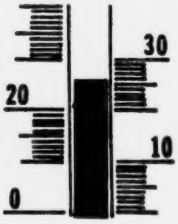
| Objectives | Measures |
|---|---|
| 6.1 Determine the difference between two times. | 6.1.1 Find the length of time from 2 a.m. to 6 p.m.<br>A. 4 hours B. 10 hours<br>C. 8 hours D. 16 hours |
| | 6.1.2 Find the length of time from 12:26 p.m. one day to 3:10 a.m. the following day. |
| 6.2 Determine the length, width, or height of an object or drawing by measuring to the nearest millimeter or eighth of an inch. | 6.2.1 Use a metric ruler to find the length of $\overline{AB}$.<br>A. 2.4 cm<br>B. 2.5 cm<br>C. 2.6 cm<br>D. 1 cm<br><br> |
| | 6.2.2 Determine your height in inches to the nearest $\frac{1}{4}$ of an inch. |
| 6.3 Determine capacity (liquid measure) by measuring quanities of liquids in metric spoons, metric cups or liters, or appropriate customary units. | 6.3.1 A gallon of milk contains how many cups?<br>A. 16 B. 32<br>C. 8 D. 24 |
| | 6.3.2 How many metric cups of cola can you get from a 2 liter bottle of cola? |
| 6.4 Determine mass (weight) by measuring to the nearest gram or kilogram, or appropriate customary units. | 6.4.1 Using a set of metric scales, you will find that 1 liter of water weighs:<br>A. 1.5 kilograms B. 1 kilogram<br>C. 2.0 kilograms D. 500 grams |
| | 6.4.2 Use a set of metric scales to determine the weight of 1 nickel. |

**COMPETENCY GOAL 6:** The learner will do some measurement activities and solve related problems.

Objectives | Measures

**6.5 Read temperature from a Celsius or Fahrenheit thermometer.**

6.5.1 The thermometer registers how many degrees?



A. 24
B. 25
C. 26
D. 23

6.5.2 Put a Celsius thermometer outside your school window. Read the temperature and record it.

**6.6 Find the perimeter of a polygon.**

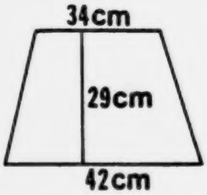
6.6.1 One side of a regular pentagon has a measure of 15 cm. What is the perimeter of the pentagon?

A. 75 cm
B. 60 cm
C. 90 cm
D. 45 cm

6.6.2 Draw a polygon and determine the perimeter of the figure.

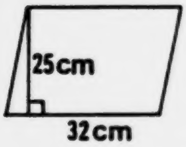
**6.7 Determine the areas of a rectangle, square, triangle, parallelogram and trapezoid.**

6.7.1 Find the area of the trapezoid.

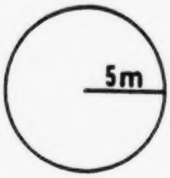
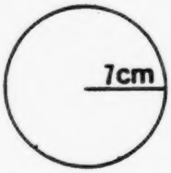


A. 1,218 sq. cm
B. 1,102 sq. cm
C. 986 sq. cm
D. 152 sq. cm

6.7.2 Find the area of the parallelogram.



COMPETENCY GOAL 6: The learner will do some measurement activities and solve related problems.

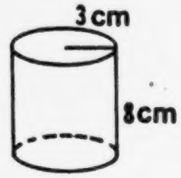
| Objectives | Measures |
|---|---|
| 6.8 Compute the circumference of a circle when either the radius or diameter is given. | 6.8.1 Find the circumference of a circle when its radius is 4". Use 3.14 for $\pi$.<br>A. 25.12"<br>B. 12.56"<br>C. 32.00"<br>D. None of the above |
| | 6.8.2 The diameter of a given circle is $3\frac{1}{2}$ cm. Compute its circumference. Use 3.14 for $\pi$. |
| 6.9 Determine the area of a circle. | 6.9.1 Find the area of the circle. Use 3.14 for $\pi$.<br>A. 3.14 $m^2$<br>B. 76.5 $m^2$<br>C. 77.5 $m^2$<br>D. 78.5 $m^2$<br> |
| | 6.9.2 Find the area of the circle.<br> <br>Use $\frac{22}{7}$ for $\pi$. |
| 6.10 Determine the volume of a rectangular prism or right circular cylinder when given the formula and/or a picture with the dimensions indicated. | 6.10.1 The formula for finding the volume of a rectangular prism is V = B x h. The base is hexagonal. The area of the base is 21 square centimeters. The height of the prism is 7.2 centimeters. The volume for the above figure is:<br>A. 149 $cm^3$<br>B. 150 $cm^3$<br>C. 151.2 $cm^3$<br>D. 149.2 $cm^3$ |
| | 6.10.2 Find the volume of a prism. The base is triangular. The area of the base is 12 square inches. The height of the prism is 9 inches. |

COMPETENCY GOAL 6: The learner will do some measurement activities and solve related problems.

**Objectives** | **Measures**

6.11 Compute the surface area of a rectangular prism or right circular cylinder when given a picture with the dimensions labeled.

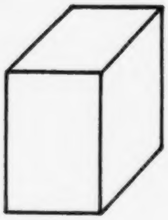
6.11.1 Find the surface area for the cylinder.
Use 3.14 for π.



A. 9.42 $cm^2$
B. 207.24 $cm^2$
C. 24 $cm^2$
D. None of the above

6.11.2 Find the surface area of a rectangular prism with the following dimensions:

$\ell$ = 8 inches
$w$ = 10 inches
$h$ = 12 inches



6.12 Find the volume and surface area of pyramids, cones and spheres.

6.12.1 Find the volume of a cone whose base has a diameter of 5 cm and a height of 6 cm.

A. 50 π $cm^3$
B. 50 $cm^3$
C. 12.5 $cm^3$
D. 12.5 π $cm^3$

6.12.2 The base of a pyramid is a square whose sides measure 10 inches. The height of each lateral face of the pyramid is 16 inches; the height of the pyramid is 14 inches. Find the surface area of the pyramid.

MATHEMATICS

Grade Level: 8 Skills/Subject Area: Mathematics

COMPETENCY GOAL 7: The learner will demonstrate a basic understanding of integers.

| Objectives | Measures |
|---|---|
| 7.1 Use < or > to compare two integers. | 7.1.1 Use < or > to compare the two integers.<br>-1 ☐ 0<br>A. <<br>B. ><br>C. They are the same<br>D. None of the above<br>7.1.2 Compare: Use < or ><br>-6 ☐ -4 |
| 7.2 Arrange several integers in increasing or decreasing order. | 7.2.1 Arrange the following integers in increasing order.<br>0, $^-3$, 6, 11, $^-1$<br>A. 0, $^-3$, 6, 11, $^-1$<br>B. $^-3$, $^-1$, 6, 11, 0<br>C. 0, $^-1$, $^-3$, 6, 11<br>D. $^-3$, $^-1$, 0, 6, 11<br>7.2.2 Arrange the following integers in decreasing order.<br>5, 6, $^-3$, $^-2$, 0, 2 |
| 7.3 Identify the absolute value of an integer. | 7.3.1 The absolute value of $^+12$ is:<br>A. 12<br>B. $^-12$<br>C. $^+(^-12)$<br>D. $(^-12)$<br>7.3.2 The $\|16\|$ is? |
| 7.4 Name the additive inverse (opposite) of an integer. | 7.4.1 Find the additive inverse of $^-4$.<br>A. 0<br>B. 8<br>C. 4<br>D. None of the above<br>7.4.2 Name the additive inverse of 0. |

**COMPETENCY GOAL 7:** The learner will demonstrate a basic understanding of integers.

| Objectives | Measures |
|---|---|
| 7.5 Add integers. | 7.5.1 Add: $(^{+}7) + (^{-}5) + (^{-}10) + (^{+}9)$<br>A. 31<br>B. 1<br>C. 15<br>D. $^{-}1$ |
| | 7.5.2 Add: $(^{-}12) + (^{+}9) + (^{-}6) + (^{+}9)$ |
| 7.6 Subtract integers. | 7.6.1 Subtract: $(^{-}8) - (^{+}3)$<br>A. $^{-}5$<br>B. 5<br>C. 11<br>D. $^{-}11$ |
| | 7.6.2 Subtract: $(^{-}8) - (^{+}2)$ |
| 7.7 Multiply integers. | 7.7.1 Multiply: $(^{-}3)\ (^{-}9)$<br>A. $^{-}12$<br>B. 12<br>C. $^{-}27$<br>D. $^{+}27$ |
| | 7.7.2 Multiply: $(^{-}8)\ (^{-}7)\ (^{-}5)$ |
| 7.8 Divide integers. | 7.8.1 Divide: $(^{+}36) \div (^{-}9)$<br>A. $^{-}27$<br>B. $^{-}4$<br>C. 4<br>D. 27 |
| | 7.8.2 Divide: $(^{-}28) \div (^{+}2)$ |

## MATHEMATICS

**Grade Level:** 8 Skills/Subject Area: Mathematics

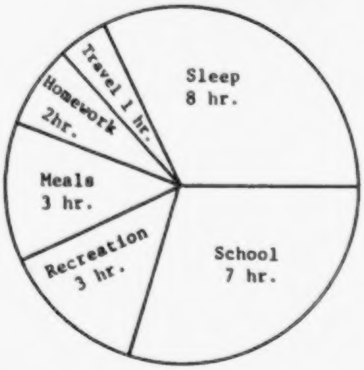
**COMPETENCY GOAL 8:** The learner will demonstrate a beginning knowledge of the real numbers.

| Objectives | Measures |
|---|---|
| 8.1 Find the square root of a number by using a table of square roots, a calculator or an algorithm. | 8.1.1 Using your calculator, find the square root of 18.<br>A. 4.243<br>B. 324<br>C. 342<br>D. 36<br>8.1.2 Use a calculator to find the square root of 7. |
| 8.2 Use the Pythagorean Theorem to determine the missing side of a right triangle. | 8.2.1 The lengths of two sides of a right triangle are 4 cm and 6 cm. Find the length of the hypotenuse to the nearest tenth of a cm.<br>A. 12.4 cm<br>B. 24 cm<br>C. 7.2 cm<br>D. None of the above<br>8.2.2 The lengths of two sides of a right triangle are 2 cm and 8 cm. Find the length of the hypotenuse, to the nearest tenth of a cm. |

MATHEMATICS

Grade Level: 8 Skills/Subject Area: Mathematics

COMPETENCY GOAL 9: The learner will demonstrate an understanding of graphs, tables, maps, and statistics.

| Objectives | Measures |
|---|---|
| 9.1 Determine the mean, median, and mode from a given set of data. | 9.1.1 Find the median of 97, 86, 93, 84, 94.<br>A. 93 B. 97 C. 94 D. 90.8 |
| | 9.1.2 Find the mode of 3,4,6,5,2,7,5. |
| 9.2 Read and interpret bar, line, circle, and picture graphs. | Title: A School Day in the life of a Student<br><br> <br>Use the circle to graph answer the questions. |
| | 9.2.1 How many hours are spent at school and sleeping?<br>A. 7 hours B. 8 hours<br>C. 15 hours D. 17 hours |
| | 9.2.2 How many hours are spent eating and doing homework? |

Skills/Subject Area: Mathematics 8

COMPETENCY GOAL 9: The learner will dem
maps, and statistics.

Objectives

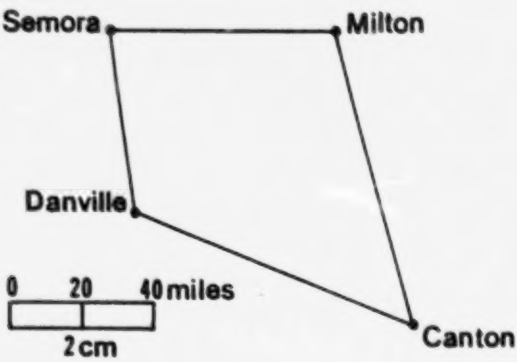
9.3 Compute the actual distance between two towns when given the scale and the distance between them on the map.

9.4 Graph whole numbers, fractions, decimals, and integers on a number line.

ill demonstrate an understanding of graphs, tables,
tistics.

Measures

9.3.1 How far to Milton from Canton?


Semora
Milton
Danville
Canton
0 20 40 miles
2 cm

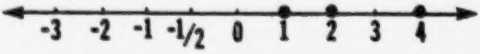
A. 38 mi.
B. 66 mi.
C. 88 mi.
D. 44 mi.

9.3.2 How far is it to Milton from Danville by way of Semora?

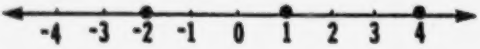
ns,

9.4.1 Choose the best answer. A number line graph of the numbers -2, 1 and 4.

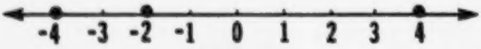
A.


-3 -2 -1 -1/2 0 1 2 3 4

B.



C.



D. None of the above

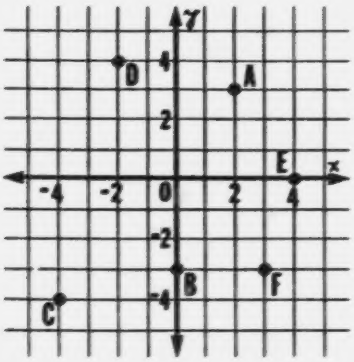
9.4.2 Graph the following real numbers on a number line.

$\frac{3}{8}, \frac{1}{4}, -\frac{1}{2}, \sqrt{3}$

**COMPETENCY GOAL 9:** The learner will demonstrate an understanding of graphs, tables, maps, and statistics.

| Objectives | Measures |
|---|---|

**9.5** Identify the ordered pair when given a point on the plane.

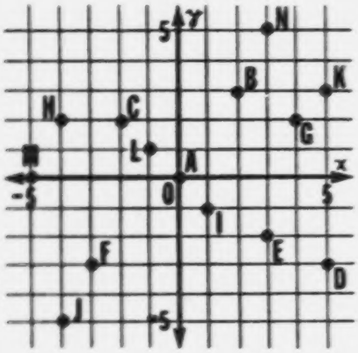


9.5.1 Given the point E on the plane. What is the ordered pair?

A. (4,0)
B. (0,4)
C. (0,0)
D. (4,4)

9.5.2 Given the point C on the plane what are its coordinates?

**9.6** Locate the point on a coordinate plane when given the ordered pair of integers that names it.



9.6.1 The ordered pair $(^-4, ^+2)$ names the location of what point?

A. H
B. G
C. F
D. E

9.6.2 Draw a graph which shows the ordered pair (3,2).

## MATHEMATICS

**Grade Level:** 8 Skills/Subject Area: Mathematics

**COMPETENCY GOAL 10:** The learner will demonstrate an understanding of the language of algebra.

| Objectives | Measures |
|---|---|
| **10.1 Read or write arithmetic expressions using words and/or symbols.** | 10.1.1 Written in words (+6) - (-17) is:<br>A. Plus 6 minus negative seventeen<br>B. Plus 6 minus seventeen<br>C. Plus 6 times minus negative seventeen<br>D. None of the above |
| | 10.1.2 Read and write in words<br>(23) · (12) |
| **10.2 Determine which symbols represent variables in an equation.** | 10.2.1 In the equation $52 = M + 6$ the variable is:<br>A. 52<br>B. =<br>C. M<br>D. + |
| | 10.2.2 Circle the variable in the equation $6x = 46$. |
| **10.3 Read and write algebraic expressions.** | 10.3.1 Write the following as an algebraic expression. "The sum of x and 2 is 12."<br>A. $x + 2 = 12$<br>B. $x + 12 = 2$<br>C. $x - 2 = 12$<br>D. $2\ x = 12$ |
| | 10.3.2 Write the following algebraic expression in words.<br>$\boxed{9X + 4Y}$ |

**COMPETENCY GOAL 10:** The learner will demonstrate an understanding of the language of algebra.

| Objectives | Measures |
|---|---|
| **10.4 Express basic mathematical and scientific principles as formulas.** | 10.4.1 Express as a formula the circumference of a circle. C is equal to two times the radius, r, times $\pi$.<br>A. $C = 2\pi$<br>B. $C = 2r$<br>C. $C = \pi r$<br>D. $C = 2\pi r$ |
|  | 10.4.2 Express as a formula the perimeter, (P), of an equilateral triangle is equal to three times the length of a side, s. |
| **10.5 Find the value of an algebraic expression using words and/or symbols.** | 10.5.1 Find the value of $A + 16$ when $A = 3$<br>A. 19<br>B. 13<br>C. 12<br>D. None of the above |
|  | 10.5.2 Find the value of $9X + 4Y$ when<br>$X = 2$ and $Y = 3$ |

# MATHEMATICS

**Grade Level: 8** Skills/Subject Area: Mathematics

**COMPETENCY GOAL 11:** The learner will demonstrate the ability to solve simple equations and inequalities.

| Objectives | Measures |
|---|---|
| **11.1 Find the solution to a simple linear equation.** | 11.1.1 Solve $X - 9 = 37$ when the replacement set is the set of real numbers.<br>A. 9<br>B. 37<br>C. 46<br>D. 28<br>11.1.2 Solve the equation for X.<br>$3X = 9$ |
| **11.2 Find the solution to a simple linear inequality** | 11.2.1 Solve $Y + 6 < 16$ when the replacement set is the set of all real numbers.<br>A. Real numbers less than 10<br>B. Real numbers greater than 6<br>C. Real numbers between 6 and 16<br>D. None of the above<br>11.2.2 Solve $X - 2 > 10$ |

# GRADES 9-12

## Major Emphases

The aim of the high school mathematics curriculum is to provide every student with appropriate mathematical content that is broad in scope. Some of the content should be immediately useful to students in their role as consumers and as part-time employees. The content must also enable students to study higher level mathematics. The mathematics curriculum then should have the flexibility to help prepare students for many different careers and vocations.

For students having a high aptitude in mathematics, courses in Algebra I, Geometry, Algebra II, and Advanced Mathematics are offered. In some schools this program is enriched by such courses as Calculus and computer-related mathematics. An alternative program consists primarily of courses in General Mathematics, Introductory Algebra (Parts 1 and 2), Technical Mathematics, and Consumer Mathematics. High schools should provide a remedial program to assist students in passing the Competency Test and in developing the necessary skills to enter other mathematics courses. The high school program should include the use of calculator and computers where feasible.

A basic high school mathematics program should contain the following course offerings:

| Non-College Preparatory | College Preparatory |
|---|---|
| General Mathematics | Algebra I |
| Consumer Mathematics | Geometry |
| Technical Mathematics | Algebra II |
| Introductory Algebra (Part 1) | Advanced Mathematics |
| Introductory Algebra (Part 2) | Calculus |
| Other electives | Other electives |

Shown in Figure 1 is a framework for planning secondary school mathematics programs. Beneath the myriad of choices is the basic opportunity of providing a sequence of mathematics courses that are alternatives to but coequal in mathematical value with the traditional Algebra I, Geometry, Algebra II, and Advanced Mathematics sequence.

Courses such as Algebra I, Algebra II, Geometry, and Advanced Mathematics have a reasonably well-defined core of content that is basically the same from class to class, school to school, and state to state. On the other hand, Consumer Mathematics, Technical Mathematics, and General Mathematics do not contain a body of fixed subject matter. Instead the subject matter can be drawn from any part of mathematics and related fields.

Several course outlines include suggestions of optional topics. It is hoped that the mathematically talented students will be provided the opportunity to study many of these topics.

Figure 1

The Mathematics Program Sequences, Grades 7-12

| Grade 7 | Grade 8 | Grade 9 | Grade 10 | Grade 11 | Grade 12 |
|---|---|---|---|---|---|
| REGULAR SEQUENCE | | | | | |
| Mathematics 7 | Mathematics 8 | General Mathematics | Technical Mathematics | | Consumer Mathematics |
| Mathematics 7 | Mathematics 8 | General Mathematics | Algebra I | | *Business Mathematics |
| Mathematics 7 | Mathematics 8 | Introductory Algebra (Pt. I) | Introductory Algebra (Pt. II) | Geometry | Algebra II |
| Mathematics 7 | Mathematics 8 | Algebra I | Geometry | Algebra II | **Advanced Mathematics |
| ACCELERATED SEQUENCE | | | | | |
| Mathematics 7 & 8 | Algebra I | Geometry | Algebra II | **Advanced Mathematics | Calculus |

*Business Mathematics is described in the curriculum guide for Business Education.
**Advanced Mathematics can be taught as a survey course or as a series of topical courses which could include Trigonometry, Analytic Geometry, Advanced Algebra, and Probability and Statistics.

The grade level under which a course is listed indicates where it is ordinarily taught. However, this listing should be used only as a suggestion. With careful planning, any course listed might be taught at a different grade level.

## General Mathematics Outline

1. Whole Numbers

    a. Round a whole number to a designated place.
    b. Arrange in increasing and decreasing order.
    c. Perform basic operations.
    d. Estimate sums, differences, products, and quotients.
    e. Compute averages and raise numbers to a given power.
    f. Find factors and multiples.
    g. Solve problems.

2. Decimals

    a. Round and compare.
    b. Perform basic operations.
    c. Estimate sums, differences, products, and quotients.
    d. Solve problems involving money.

3. Percent

    a. Convert decimals to percents and vice versa.
    b. Find a percent of a number.
    c. Find what percent one number is of another.
    d. Find a number when a percent of it is known.
    e. Solve problems.

4. Fractions

    a. Convert decimals to fractions and vice versa.
    b. Compare fractions.
    c. Add, subtract, multiply, and divide fractions and mixed numbers.
    d. Express a comparison of two numbers as a ratio.
    e. Find the missing term of a proportion.
    f. Convert fractions to percents and vice versa.
    g. Use fractions or proportions to solve problems.

5. Geometry

    a. Use geometric terms.
    b. Recognize lines and angles.
    c. Classify polygons and their properties.
    d. Identify circles and their properties.
    e. Recognize and use space figures.
    f. Solve problems.

6. Measurement

   a. Find perimeter, area, and volume of geometric figures.
   b. Solve problems involving time and temperature.

7. Probability and Statistics

   a. Read and interpret charts, tables, and diagrams.
   b. Read and interpret bar, circle, and line graphs.
   c. Read and interpret maps and scale drawings.
   d. Determine the mean, median, and mode from a given set of data.

8. Integers

   a. Represent integers on a number line.
   b. Add, subtract, multiply, and divide.
   c. Solve problems.

## MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: General Math

COMPETENCY GOAL 1: The learner will use a variety of problem solving strategies to solve real and contrived problems.

---

Objectives — Measures

---

1.1 Use the guess/check/refine skill to solve certain problems.

1.1.1 Use any of the digits 1 through 9 to make true statements. Put the same number in the same shape in the two statements.

◇ + □ = 11

◇ − □ = 3

a. ◇8 □3 b. ◇3 □8

c. ◇4 □7 d. ◇7 □4

1.1.2 Each row, column, and diagonal of this magic square adds to 15. Use the numbers 1, 2, 4, 5, 7 and 8 to complete the magic square.

| | | |
|---|---|---|
| | 9 | |
| | | 3 |
| 6 | | |

1.2 Use the look-for-a-pattern technique in solving certain problems.

1.2.1 Continue the pattern:

A, D, G, J, ____

a. A b. M c. L d. N

1.2.2 Look for a pattern. Fill in the blank: 1, 3, 9, 27, ____ COMPETENCY GOAL 1: The learner will use a variety of problem solving strategies to solve real and contrived problems.

| Objectives | Measures |
|---|---|

1.3 Make a systematic list to solve certain problems.

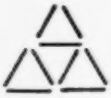
1.3.1 In how many ways can you make 16¢ change?

a. 2 b. 5 c. 6 d. 7

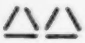
1.3.2 Make a systematic list to show the 3-digit numbers that can be made using 3, 6, 7 one time each for each number.

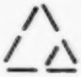
1.4 Make a drawing or model as an aid in solving certain problems.

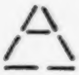
1.4.1 Arrange 9 toothpicks, straws, or paper clips in the following pattern:

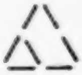


Take away 2 toothpicks (straws or (paper clips) and have 2 triangles left. Which of these is not correct?

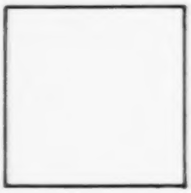
a. 

b. 

c. 

d. 

1.4.2 Draw 3 straight line segments through the square cutting the square region into 6 pieces.



## MATHEMATICS

**Grade Level: 9-12** Skills/Subject Area: General Math

**COMPETENCY GOAL 2:** The learner will identify and recognize different uses of numbers.

| Objectives | Measures |
|---|---|
| **2.1 Determine the difference between the cardinal and ordinal use of numbers.** | 2.1.1 Which of the following is an ordinal number:<br>{3, three, $3^2$, third}<br>a. 3 b. three c. $3^2$ d. third |
| | 2.1.2 The Detroit Tigers really tore up the American League East in 1984. They were in first place for the entire season! Detroit finished the year with a team batting average of .271 and led the league in pitching with an ERA of 3.49 and finished the year with more than 100 victories!<br>Which of the examples above is an ordinal use of number? |
| **2.2 Recognize such non-computational uses of numbers as zip code, telephone, social security, and bank account numbers.** | 2.2.1 The number 439-54-2673 is probably a:<br>a. telephone number<br>b. social security number<br>c. zip code<br>d. address |
| | 2.2.2 List 6 non-computational uses of numbers. |

Grade Level: 9-12 Skills/Subject Area: General Math

COMPETENCY GOAL 3: The learner will demonstrate an understanding of and perform operations with whole numbers.

| | Objectives | | Measures |
|---|---|---|---|
| 3.1 | Read and write either numerals or word names for whole numbers through billions. | 3.1.1 | Write 4 million, 40 thousand, 4 using numerals (standard notation).<br>a. 4,040,4 b. 4,040,04<br>c. 4,40,004 d. 4,040,004 |
| | | 3.1.2 | Write 78,909,035 using word names. |
| 3.2 | Round a whole number to an indicated place through billions. | 3.2.1 | Round 527,548 to the nearest thousand.<br>a. 530,000 b. 528,000<br>c. 527,000 d. 527,500 |
| | | 3.2.2 | Round 47,650 to the nearest hundred. |
| 3.3 | Use <, =, or > to compare two whole numbers. | 3.3.1 | Replace the ? with <, =, or > to make a true statement.<br>34 ? 43<br>a. < b. =<br>c. > d. None of these |
| | | 3.3.2 | Replace the ? with <, =, or > to make a true statement:<br>1109 ? 1010 |
| 3.4 | Arrange two or more whole numbers in increasing or decreasing order. | 3.4.1 | Arrange the following three-digit numbers in decreasing order:<br>{972, 991, 927, 990}<br>a. 927, 972, 990, 991<br>b. 990, 991, 972, 927<br>c. 991, 990, 972, 927<br>d. 991, 990, 927, 972 |
| | | 3.4.2 | Arrange the following numbers in increasing order:<br>{1101, 1099, 1011, 1109} |

Skills/Subject Area: General Math

COMPETENCY GOAL 3: The learner will demonstrate an understanding of and perform operations with whole numbers.

| | Objectives | | Measures |
|---|---|---|---|
| 3.5 | Add two 4-digit whole numbers. | 3.5.1 | Add: 6507 + 2836<br>a. 8333 b. 8343<br>c. 9343 d. 813,313 |
| | | 3.5.2 | Add: $\begin{array}{r}6491\\ \underline{+3209}\end{array}$ |
| 3.6 | Add three 3-digit whole numbers. | 3.6.1 | Add: 357 + 826 + 174<br>a. 1357 b. 1247<br>c. 1257 d. 1321 |
| | | 3.6.2 | Add: $\begin{array}{r}894\\ 103\\ \underline{+987}\end{array}$ |
| 3.7 | Estimate the sum of two or more whole numbers. | 3.7.1 | Estimate the sum by rounding to the nearest hundred: $\begin{array}{r}492\\ \underline{+\ 205}\end{array}$<br>a. 500 b. 200 c. 700 d. 600 |
| | | 3.7.2 | Estimate the sum by rounding to the nearest hundred: $\begin{array}{r}3284\\ 715\\ \underline{+\ 806}\end{array}$ |
| 3.8 | Use the addition property of equality to solve equations. | 3.8.1 | Solve for x: $x - 7 = 15$<br>a. 15 b. 22 c. 7 d. 8 |
| | | 3.8.2 | Solve for x: $x - 22 = 18$ |
| 3.9 | Find the difference between two 4-digit whole numbers. | 3.9.1 | Subtract: 7005 - 3148<br>a. 3857 b. 3967 c. 4143 d. 4957 |
| | | 3.9.2 | Subtract: $\begin{array}{r}6400\\ \underline{-2837}\end{array}$ |

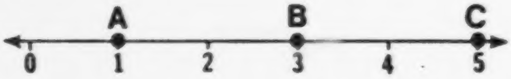
**COMPETENCY GOAL 3:** The learner will demonstrate an understanding of and perform operations with whole numbers.

| Objectives | Measures |
|---|---|
| **3.10 Estimate the difference between two whole numbers.** | 3.10.1 Estimate the difference by rounding to the nearest thousand:<br>6813 - 2547<br>a. 7000 b. 4300 c. 3000 d. 4000 |
| | 3.10.2 Estimate the difference by rounding to the nearest thousand: 8497<br>-4502 |
| **3.11 Use the subtraction property of equality to solve equations.** | 3.11.1 Solve for n: n + 7 = 35<br>a. 42 b. 28 c. 35 d. 7 |
| | 3.11.2 Solve for n: 16 + n = 48 |
| **3.12 Multiply two 2-digit whole numbers.** | 3.12.1 Multiply: 49 x 76<br>a. 637 b. 3724 c. 3074 d. 5317 |
| | 3.12.2 Multiply: 97<br>x80 |
| **3.13 Estimate the product of two whole numbers.** | 3.13.1 Estimate the product by rounding each factor to the nearest ten: 82 x 67<br>a. 80 b. 70 c. 5600 d. 5494 |
| | 3.13.2 Estimate the product: 379<br>x 8 |
| **3.14 Divide a 4-digit whole number by a 2-digit whole number.** | 3.14.1 Divide: 7368 ÷ 24<br>a. 307 b. 37<br>c. 3 R 168 d. 6767 |
| | 3.14.2 Divide: 6743 ÷ 27 |

| Objectives | Measures |
|---|---|
| 3.15 Estimate the quotient of two whole numbers. | 3.15.1 Estimate the quotient: 2491 ÷ 52<br>a. 2500 ÷ 52 b. 2400 ÷ 50<br>c. 2500 ÷ 50 d. 2490 ÷ 50<br>3.15.2 Estimate the quotient: 5951 ÷ 29 |
| 3.16 Find the arithmetic average (mean) of a set of whole numbers. | 3.16.1 Find the mean (average) of the following numbers:<br>21, 23, 19, 20, 22<br>a. 105 b. 19 c. 20 d. 21<br>3.16.2 Find the mean (average) of the following numbers.<br>62, 71, 88, 91 |
| 3.17 Determine the median of a set of whole numbers. | 3.17.1 Determine the median of the following set of numbers:<br>78, 85, 81, 80, 86<br>a. 82 b. 81 c. 410 d. 80<br>3.17.2 Write a set of five numbers which has 12 as the median. |
| 3.18 Identify the mode of a set of whole numbers. | 3.18.1 Identify the mode of the following set of whole numbers.<br>27, 31, 25, 27, 34, 25, 27<br>a. 27 b. 25 c. 196 d. 28<br>3.18.2 Identify the mode:<br>48, 50, 50, 51, 53, 55, 51, 58 |

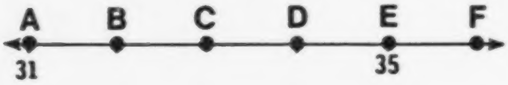
COMPETENCY GOAL 3: The learner will demonstrate an understanding of and perform operations with whole numbers.

| Objectives | Measures |
|---|---|
| 3.19 Solve problems (both real and contrived) involving whole numbers. Use a calculator when appropriate. | 3.19.1 Our high school football team averaged scoring 17 points for each of its 5 home games. How many points did they score at home this season?<br>a. 5 b. 17 c. 85 d. 22 |
| | 3.19.2 At the first home basketball game there were 675 people present. Only 432 came to the second game. How many more people saw the first game? |
| 3.20 Name the whole number coordinate of a point on a number line. | 3.20.1 Name the location (coordinate) of Point B: |

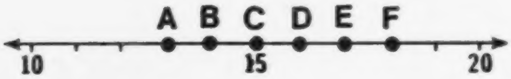


a. 1 b. 3 c. 4 d. 5

3.20.2 Name the location (coordinate) of Point C on the number line:

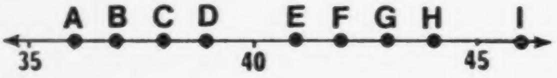


| Objectives | Measures |
|---|---|
| 3.21 Locate the graph of a whole number on a number line. | 3.21.1 Name the point that is the graph of 17 on the number line below: |



a. E b. D c. A d. F

3.21.2 Name the point that is the graph of 38 on the number line below:



**COMPETENCY GOAL 3:** The learner will demonstrate an understanding of and perform operations with whole numbers.

| Objectives | Measures |
|---|---|
| 3.22 Find the square of a whole number by using a table of squares, multiplication, or a calculator. | 3.22.1 What is the value of $60^2$?<br>a. 100 b. 3600<br>c. 120 d. 360<br>3.22.2 What is the value of $37^2$? |
| 3.23 Raise a whole number to an indicated power by multiplication or by calculator. | 3.23.1 What is the value of $5^3$?<br>a. 15 b. 243 c. 125 d. 53<br>3.23.2 What is the value of $4^2$? |
| 3.24 Find the square root of a number using a table of square roots, a calculator, or an algorithm. | 3.24.1 The square root of 784 is:<br>a. $784^2$ b. 392<br>c. 28 d. 196<br>3.24.2 Find the square root of 144. |
| 3.25 Find the factors of a whole number. | 3.25.1 List all the factors of 18.<br>a. 1,18 b. 1,2,3,6,9,18<br>c. 3x6 d. 3,6,9,12,15,18<br>3.25.2 List all the factors of 15. |
| 3.26 Find the greatest common factor (GCF) of two whole numbers. | 3.26.1 What is the greatest common factor (GCF) of 18 and 24?<br>a. 1 b. 9 c. 18 d. 6<br>3.26.2 What is the greatest common factor (GCF) of 42 and 45? |

**COMPETENCY GOAL 3:** The learner will demonstrate an understanding of and perform operations with whole numbers.

| Objectives | | Measures | |
|---|---|---|---|
| **3.27** | **Write and identify several multiples of a whole number.** | 3.27.1 | Which of the following is not a set of multiples of 8?<br>a. {8, 48, 54, 72 }<br>b. {16, 24, 32, 40}<br>c. {16, 32, 40, 64}<br>d. {8, 24, 64, 72} |
| | | 3.27.2 | List the first five multiples of 7. |
| **3.28** | **Determine the least common multiple (LCM) of two whole numbers.** | 3.28.1 | The least common multiple (LCM) of 6 and 8 is:<br>a. 24 b. 12 c. 2 d. 48 |
| | | 3.28.2 | What is the least common multiple (LCM) of 4 and 10? |

## MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: General Math

COMPETENCY GOAL 4: The learner will demonstrate an understanding of and perform operations with decimal numbers (decimals).

| Objectives | Measures |
|---|---|
| **4.1 Read and write either numerals or word names for decimals through thousandths.** | 4.1.1 Write 24 and 357 thousandths in decimal notation.<br>a. 357,024 b. 24,357<br>c. 24.357 d. 0.24357<br>4.1.2 What is the word name for 202.202? |
| 4.2 Round a decimal to an indicated place. | 4.2.1 Round 3495 to the nearest thousand.<br>a. 4000 b. 3000<br>c. 3500 d. 3490<br>4.2.2 Round 12.397 to the nearest hundredth. |
| 4.3 Use <, =, or > to compare two decimals. | 4.3.1 Replace the ? with < , =, or > to make a true statement.<br>0.614 _?_ 0.62<br>a. < b. =<br>c. > d. none of these<br>4.3.2 Replace the ? with < , =, or > to make statement.<br>1.78 _?_ 0.780 |
| 4.4 Arrange three or more decimals in increasing or decreasing order. | 4.4.1 Arrange the following decimals in decreasing order:<br>2.73, 2.07, 2.37, 2.073<br>a. 2.073, 2.73, 2.07, 2.37<br>b. 2.073, 2.07, 2.37, 2.73<br>c. 2.073, 2.73, 2.37, 2.07<br>d. 2.73, 2.37, 2.073, 2.07<br>4.4.2 Write 4 two-place decimals between 2 and 3. Arrange them in increasing order. |

**COMPETENCY GOAL 4:** The learner will demonstrate an understanding of and perform operations with decimal numbers (decimals).

| Objectives | Measures |
|---|---|
| 4.5 Add two decimals. | 4.5.1 Add 20.384 and 15.61:<br>a. 219.45 b. 21.945<br>c. 35.994 d. 0.35994 |
| | 4.5.2 Add: 5.87 and 8.2 |
| 4.6 Estimate the sum of two decimals. | 4.6.1 Estimate the sum by rounding each addend to the nearest whole number.<br>17.49<br>+ 8.54<br>a. 8 b. 9 c. 17 d. 26 |
| | 4.6.2 Estimate the sum of 27.849 and 30.51 by first rounding each to the nearest whole number. |
| 4.7 Subtract one decimal from another. | 4.7.1 Subtract: 9.37 - 4.5<br>a. 13.87 b. 9.82<br>c. 4.87 d. 5.92 |
| | 4.7.2 Subtract: 5.37<br>- 1.284 |
| 4.8 Estimate the difference between two decimals. | 4.8.1 Estimate the difference by first rounding to the nearest whole number.<br>19.382 - 6.501<br>a. 26 b. 12 c. 13 d. 12.881 |
| | 4.8.2 Estimate the difference by first rounding to the nearest whole number.<br>15.283<br>- 9.4 |
| 4.9 Add and subtract money amounts. | 4.9.1 Add: $75.64 and $32.28<br>a. $10,782 b. $107.82<br>c. $43.36 d. $107.92 |
| | 4.9.2 Subtract: $47.18 - $6.92 |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of and perform operations with decimal numbers (decimals).

| Objectives | Measures |
|---|---|
| 4.10 Compute the product of two decimals. | 4.10.1 Multiply: 5.37<br>x 4.6<br>a. 2470.2 b. 24.702<br>c. 5.83 d. 247.02 |
| | 4.10.2 Multiply: 64.3 x 0.05 |
| 4.11 Estimate the product of two decimals. | 4.11.1 Estimate the product by rounding each factor to the nearest whole number.<br>6.7 x 9.2<br>a. 16 b. 54 c. 63 d. 61.64 |
| | 4.11.2 Estimate the product by rounding each factor to the nearest whole number.<br>3.14 x 8.52 |
| 4.12 Multiply a money amount by a whole number or a decimal. | 4.12.1 Multiply: \$9.45 x 7<br>a. \$66.15 b. \$16.45<br>c. \$63 d. \$63.45 |
| | 4.12.2 Multiply: \$47.50<br>X 8 |
| 4.13 Divide a money amount by a whole number. | 4.13.1 Divide: \$27.45 ÷ 5<br>a. \$54.90 b. \$549<br>c. \$32.45 d. \$5.49 |
| | 4.13.2 Divide: \$75.12 ÷ 4 |
| 4.14 Divide one decimal by another. | 4.14.1 Divide: 2.25 ÷ 0.09<br>a. 0.25 b. 25 c. 2.5 d. 4 |
| | 4.14.2 Divide: 1.8 ÷ 0.002 |

COMPETENCY GOAL 4: The learner will demonstrate an understanding of and perform operations with decimal numbers (decimals).

| Objectives | Measures |
|---|---|
| 4.15 Estimate the quotient of two decimals. | 4.15.1 Estimate the quotient by first rounding to the nearest whole number and then dividing. 39.8 ÷ 3.62<br>a. 40 b. 4 c. 13 d. 10 |
| | 4.15.2 Estimate the quotient by first rounding to the nearest whole number and then dividing. 35.68 ÷ 7.2 |
| 4.16 *Solve equations containing decimals. | 4.16.1 Find the value of n: $n + 17.32 = 45.65$<br>a. 62.97 b. 63<br>c. 28.33 d. 28 |
| | 4.16.2 Find the value of x: $x - 27.4 = 16.9$ |
| 4.17 Solve problems (both real and contrived) involving decimals. Use a calculator when appropriate. | 4.17.1 The Browns live in Raleigh and visited relatives in Winston-Salem. Their car used 8.9 gallons of fuel on the 237 mile trip. How many miles per gallon (to the nearest tenth of a mile) does their car get?<br>a. 26.6 b. 8.9 c. 26.3 d. 122.95 |
| | 4.17.2 If you can do 12 push ups in 9 seconds, how many push ups is that per second? Find the answer to the nearest hundredth. |

*Optional

MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: General Math

COMPETENCY GOAL 5: The learner will demonstrate an understanding of and perform operations with percent.

| | Objectives | | Measures |
|---|---|---|---|
| 5.1 | Provide a definition or meaning for a given percent. | 5.1.1 | 25% does not always mean:<br>[illegible] 25 cents b. 0.25<br>[illegible]. 25 parts out of 100 d. one-fourth |
| | | 5.[illegible]2 | Explain what 5% means. |
| 5.2 | Change a decimal to a percent. | 5.2.1 | Change 0.65 to a percent.<br>a. .65% b. 65 c. 65% d. 6.5% |
| | | 5.2.2 | Convert 0.045 to a percent. |
| 5.3 | Change a percent to a decimal. | 5.3.1 | Change 37% to a decimal.<br>a. 37.0 b. 0.37 c. 3700 d. 3.7 |
| | | 5.3.2 | Convert 15% to a decimal. |
| 5.4 | Find a percent of a number. | 5.4.1 | What is 125% of 8?<br>a. 1000 b. 1<br>c. 100 d. 10 |
| | | 5.4.2 | What is 4.5% of 100? |
| 5.5 | Solve problems involving commission and discount. | 5.5.1 | How much would you save buying a television set whose list price is $550 which is on sale at a 25% discount?<br>a. $13.75 b. $137.50<br>c. $412.50 d. $25.00 |
| | | 5.5.2 | How much would a salesman earn from selling $6500 worth of equipment from which he gets a 6% commission? |

Skills/Subject Area: General Math

•COMPETENCY GOAL 5: The learner will demonstrate an understanding of and perform operations with percent.

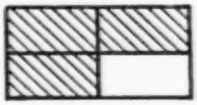
| | Objectives | | Measures |
|---|---|---|---|
| 5.6 | Solve problems involving sales tax and simple interest. | 5.6.1 | The 4.5% sales tax on a purchase of $68 is:<br>a. $3.06 b. $30.60<br>c. $71.06 d. $0.31 |
| | | 5.6.2 | Determine the amount of simple interest earned on a $1200 deposit in one year at the rate of 9%. |
| 5.7 | Find what percent one number is of another. | 5.7.1 | What percent of 25 is 16?<br>a. 25% b. 16% c. 156.25% d. 64% |
| | | 5.7.2 | 8 is what percent of 40? |
| 5.8 | Solve problems involving percent of increase and decrease. | 5.8.1 | Last year Central High School had 800 students. This years' enrollment dropped to 600. What was the percent of decrease?<br>a. 75% b. $33\frac{1}{3}$% c. 25% d. $133\frac{1}{3}$% |
| | | 5.8.2 | Before Randy started lifting weights, he weighed 100 pounds. Now, less than two years later, he weighs 125 pounds. Find the percent of increase. |
| 5.9 | *Find a number when a percent is known. | 5.9.1 | 17 is 20% of what number?<br>a. 85 b. 3.4 c. 0.85 d. 34 |
| | | 5.9.2 | 24 is 3% of what number? |

*Optional

## MATHEMATICS

**Grade Level:** 9-12 **Skills/Subject Area:** General Math

**COMPETENCY GOAL 6:** The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| Objectives | Measures |
|---|---|
| 6.1 Give more than one interpretation, model, or meaning to a fraction. | 6.1.1 Which of the following would not be a model for $\frac{3}{4}$?<br>a. <br>b. 4 students, 3 are girls<br>c. Cut a pie into 7 parts. 4 are eaten. How much is left?<br>d. none of these |
| | 6.1.2 Describe a situation which can be represented by the fraction $\frac{2}{5}$. |
| 6.2 Use a fraction to describe the probability or chance of an event hapening. | 6.2.1 What is the chance of flipping a coin twice and getting two heads?<br>a. $\frac{1}{4}$ b. $\frac{1}{2}$ c. $\frac{1}{3}$ d. 1 |
| | 6.2.2 What is meant when the weather report indicates there is a 70% chance of afternoon thundershowers. |
| 6.3 Write fractions equivalent to a given fraction. | 6.3.1 Which of the following fractions is not equivalent to $\frac{1}{2}$?<br>a. $\frac{3}{6}$ b. $\frac{4}{6}$ c. $\frac{5}{10}$ d. $\frac{2}{4}$ |
| | 6.3.2 Write four fractions equivalent to $\frac{1}{4}$. |
| 6.4 Change a decimal to a fraction. | 6.4.1 Change 0.24 to a fraction.<br>a. $2\frac{4}{100}$ b. 2400<br>c. $\frac{24}{10}$ d. $\frac{24}{100}$ |
| | 6.4.2 Change 3.14 to a fraction. |

**COMPETENCY GOAL 6:** The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| | Objectives | | Measures |
|---|---|---|---|
| 6.5 | Change a common fraction to a decimal, for example $\frac{1}{4}$, $\frac{1}{3}$, and $\frac{1}{2}$. | 6.5.1 | Convert $\frac{5}{9}$ to a decimal. Round to the nearest hundredth.<br>a. 1.80 b. 0.56 c. 1.8 d. 0.555 |
| | | 6.5.2 | Convert $\frac{25}{4}$ to a decimal. |
| 6.6 | Use <, >, or = to compare two fractions. | 6.6.1 | Replace the ? with <, =, or > to make a true statement.<br>$\frac{3}{4}$ ? $\frac{5}{8}$<br>a. > b. =<br>c. < d. none of these |
| | | 6.6.2 | Replace the ? with <, =, or > to make a true statement:<br>$\frac{2}{10}$ ? $\frac{21}{100}$ |
| 6.7 | Change a fraction to a whole number or a mixed number. | 6.7.1 | $\frac{20}{8}$ written as a mixed number in simplest form is:<br>a. $2\frac{4}{8}$ b. 20 ÷ 8<br>c. $\frac{2}{5}$ d. $2\frac{1}{2}$ |
| | | 6.7.2 | Change $\frac{35}{6}$ to a mixed number. |
| 6.8 | Change a whole number or mixed number to a fraction. | 6.8.1 | $7\frac{3}{4}$ written as an improper fraction is:<br>a. $\frac{25}{4}$ b. $\frac{31}{4}$<br>c. $\frac{10}{4}$ d. $\frac{73}{4}$ |
| | | 6.8.2 | Write $6\frac{7}{10}$ as an improper fraction. |

**Skills/Subject Area:** General Math

**COMPETENCY GOAL 6:** The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| | Objectives | | Measures |
|---|---|---|---|
| 6.9 | Write a fraction in its simplest form. | 6.9.1 | Select the simplest form of $\frac{12}{36}$.<br>a. $\frac{4}{9}$ b. $\frac{4}{12}$<br>c. $\frac{1}{3}$ d. $\frac{24}{72}$ |
| | | 6.9.2 | Change $\frac{8}{20}$ to its simplest form. |
| 6.10 | Use the division property of equality to solve equations. | 6.10.1 | Solve: $5X = 32$<br>a. $5 \times 32 = 160$ b. $\frac{5}{32}$<br>c. $\frac{32}{5}$ d. 37 |
| | | 6.10.2 | Solve: $4x = 27$ |
| 6.11 | Add two or more fractions and simplify the answer. | 6.11.1 | Add and simplify: $\frac{1}{2} + \frac{5}{6}$<br>a. $\frac{6}{8}$ b. $\frac{5}{12}$<br>c. $\frac{3}{4}$ d. $\frac{8}{6}$ or $1\frac{1}{3}$ |
| | | 6.11.2 | Add and simplify: $\frac{3}{4} + \frac{3}{20}$ |
| 6.12 | Add two mixed numbers and simplify the answer. | 6.12.1 | Add and simplify: $12\frac{5}{8} + 1\frac{7}{8}$<br>a. $14\frac{12}{16}$ or $14\frac{3}{4}$ b. $13\frac{1}{2}$<br>c. $14\frac{12}{8}$ d. $14\frac{1}{2}$ |
| | | 6.12.2 | Add and simplify: $3\frac{1}{2} + 6\frac{3}{4}$ |

**COMPETENCY GOAL 6:** The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| | Objectives | Measures |
|---|---|---|
| 6.13 | Estimate the sum of two mixed numbers. | 6.13.1 Estimate the sum of $7\frac{3}{5}$ and $6\frac{1}{2}$<br>a. about 13  b. about 42<br>c. about 14  d. about 1<br>6.13.2 Estimate the sum of $1\frac{1}{2}$ and $2\frac{3}{4}$ |
| 6.14 | Compute the difference between two fractions. | 6.14.1 Subtract and give the difference in simplest form: $\frac{5}{6} - \frac{1}{3}$<br>a. $\frac{3}{6}$  b. $\frac{1}{2}$<br>c. $\frac{2}{3}$  d. $\frac{4}{3}$ or $1\frac{1}{3}$<br>6.14.2 Subtract: $\frac{7}{12} - \frac{3}{8}$ |
| 6.15 | Subtract a fraction or mixed number from a mixed number. | 6.15.1 Subtract and simplify: $8\frac{5}{8} - \frac{3}{4}$<br>a. $7\frac{7}{8}$  b. $8\frac{7}{8}$<br>c. $8\frac{1}{2}$  d. $9\frac{3}{8}$<br>6.15.2 Subtract: $5\frac{1}{4} - 1\frac{1}{2}$ |
| 6.16 | Estimate the difference between two mixed numbers. | 6.16.1 Estimate the difference: $12\frac{3}{8} - 4\frac{3}{4}$<br>a. about 16  b. about 9<br>c. about 8  d. about $7\frac{1}{2}$<br>6.16.2 Estimate the difference: $13\frac{3}{5} - 7\frac{1}{2}$ |
| 6.17 | Multiply a whole number by a fraction. | 6.17.1 Multiply and simplify: $8 \times \frac{3}{16}$<br>a. $\frac{5}{2}$ or $2\frac{1}{2}$  b. $8\frac{5}{16}$<br>c. $\frac{133}{16}$  d. $\frac{40}{16}$<br>6.17.2 Multiply and simplify: $10 \times \frac{3}{4}$ |

**COMPETENCY GOAL 6:** The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| | Objectives | | Measures |
|---|---|---|---|
| 6.18 | **Use the multiplication property of equality to solve equations.** | 6.18.1 | Solve $\frac{x}{3} = 17 \quad x = ?$<br>a. $\frac{17}{3}$ or $5\frac{2}{3}$ b. 51<br>c. 14 d. 20 |
| | | 6.18.2 | Solve: $\frac{m}{5} = 35$ |
| 6.19 | **Use more than one property of equality to solve an equation.** | 6.19.1 | Solve: $3x + \frac{2}{3} = 12\frac{2}{3}$<br>a. $x = 36$ b. $x = 12$<br>c. $x = 4$ d. $x = 4\frac{2}{3}$ |
| | | 6.19.2 | Solve: $6n - 7 = 41$ |
| 6.20 | **Find the product of two fractions.** | 6.20.1 | Multiply and simplify: $\frac{7}{8} \times \frac{4}{21}$<br>a. $\frac{1}{6}$ b. $\frac{32}{147}$<br>c. $\frac{28}{168}$ d. $\frac{7}{42}$ |
| | | 6.20.2 | Multiply and simplify: $\frac{5}{10} \times \frac{8}{10}$ |
| 6.21 | **Multiply two mixed numbers.** | 6.21.1 | Multiply and simplify: $2\frac{1}{2} \times 4\frac{1}{10}$<br>a. $8\frac{1}{20}$ b. $\frac{14}{5}$ or $2\frac{4}{5}$<br>c. $10\frac{1}{5}$ d. $\frac{41}{4}$ or $10\frac{1}{4}$ |
| | | 6.21.2 | Multiply and simplify: $3\frac{1}{3} \times 4\frac{2}{5}$ |

COMPETENCY GOAL 6: The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| | Objectives | | Measures |
|---|---|---|---|
| 6.22 | Estimate the product of two mixed numbers. | 6.22.1 | Estimate the product: $3\frac{1}{2} \times 15\frac{3}{10}$<br>a. $53\frac{11}{20}$ b. more than 45<br>c. less than 45 d. $18\frac{3}{20}$ |
| | | 6.22.2 | Estimate the product: $4\frac{2}{3} \times 6\frac{1}{4}$ |
| 6.23 | Divide two fractions. | 6.23.1 | Divide and simplify: $\frac{3}{8} \div \frac{1}{2}$<br>a. $\frac{3}{4}$ b. $\frac{6}{8}$<br>c. $\frac{3}{16}$ d. $\frac{4}{3}$ or $1\frac{1}{3}$ |
| | | 6.23.2 | Divide and simplify: $\frac{8}{15} \div \frac{2}{5}$ |
| 6.24 | Determine the quotient of two mixed numbers. | 6.24.1 | Divide and simplify: $4\frac{1}{2} \div 2\frac{1}{3}$<br>a. $\frac{21}{2}$ or $10\frac{1}{2}$ b. $3\frac{1}{2}$<br>c. $\frac{27}{14}$ or $1\frac{13}{14}$ d. $\frac{14}{27}$ |
| | | 6.24.2 | Divide and simplify: $10\frac{2}{3} \div 2\frac{2}{3}$ |
| 6.25 | Estimate the quotient of two mixed numbers. | 6.25.1 | Estimate the quotient: $8\frac{1}{3} \div 1\frac{3}{4}$<br>a. about 8 b. about 4<br>c. $\frac{100}{21}$ or $4\frac{16}{21}$ d. $\frac{21}{100}$ |
| | | 6.25.2 | Estimate the quotient: $12\frac{1}{5} \div 4\frac{1}{3}$ |

COMPETENCY GOAL 6: The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| | Objectives | | Measures |
|---|---|---|---|
| 6.26 | Solve problems (both real and contrived) involving fractions. Use a calculator when appropriate. | 6.26.1 | If you took a trip and traveled on an interstate highway at a speed of 55 miles per hour for $4\frac{1}{2}$ hours, how far would you have gone?<br>a. 55 miles<br>b. $59\frac{1}{2}$ miles<br>c. 220 miles<br>d. $247\frac{1}{2}$ miles |
| | | 6.26.2 | To serve 14 people each $\frac{1}{2}$ pound of hamburger at a party how much hamburger is needed? |
| 6.27 | Write ratios to describe given situations. | 6.27.1 | A General Math class has 7 girls and 14 boys. Write the ratio of girls to boys in simplest form.<br>a. $\frac{7}{21}$<br>b. $\frac{7}{14}$<br>c. $\frac{1}{2}$<br>d. $\frac{14}{7}$ or 2 |
| | | 6.27.2 | A cloth bag contains 2 red marbles and 3 blue marbles. What is the chance of reaching in and randomly taking out a blue marble? |
| 6.28 | Find the missing term in a proportion. | 6.28.1 | Solve: $\frac{3}{4} = \frac{n}{24}$ n = ?<br>a. 18 b. 32 c. 72 d. 23 |
| | | 6.28.2 | Solve: $\frac{4}{7} = \frac{9}{n}$ |
| 6.29 | Change a percent to a fraction. | 6.29.1 | Write 125% as a fraction in simplest form.<br>a. $\frac{125}{100}$<br>b. $\frac{100}{125}$ or $\frac{4}{5}$<br>c. $\frac{125}{1000}$ or 0.125<br>d. $\frac{5}{4}$ or $1\frac{1}{4}$ |
| | | 6.29.2 | Write 65% as a fraction in simplest form |

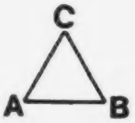
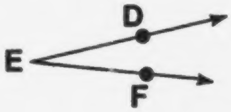
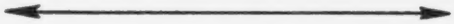
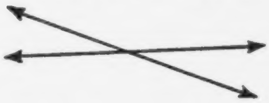
**COMPETENCY GOAL 6:** The learner will demonstrate an understanding of and perform operations with fractional numbers (fractions).

| Objectives | Measures |
|---|---|
| 6.30 Change a fraction to a percent. | 6.30.1 Change $\frac{1}{8}$ to a percent.<br>a. 1.25% b. 12.5%<br>c. 125% d. 8%<br>6.30.2 Change $\frac{3}{4}$ to a percent. |
| 6.31 Find a percent of a number using fractions. | 6.31.1 75% of 35 is what number?<br>a. 110 b. $35\frac{3}{4}$<br>c. $\frac{105}{4}$ or $26\frac{1}{4}$ d. $2\frac{1}{7}$<br>6.31.2 Convert the percent to a fraction and solve: 50% of 75. |

MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: General Math

COMPETENCY GOAL 7: The learner will identify and classify geometric figures and some of their parts.

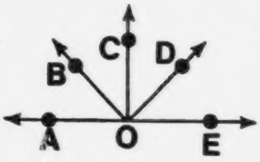
| | Objectives | | Measures |
|---|---|---|---|
| 7.1 | Identify such basic geometric terms as point, line, line segment, ray, angle, plane, and space. | 7.1.1 |  <br>Side AB in this triangle may also be called:<br>a. angle CAB b. segment AB<br>c. line AB d. point A |
| | | 7.1.2 | What is the name of this geometric figure?<br> |
| 7.2 | Identify vertical, horizontal, and diagonal lines (segments). | 7.2.1 | What is the direction of the line shown below?<br><br>a. perpendicular b. vertical<br>c. diagonal d. horizontal |
| | | 7.2.2 | Draw a vertical line on your answer sheet. |
| 7.3 | Identify intersecting, parallel, and perpendicular lines. | 7.3.1 | Identify how these two lines are related to each other:<br><br>a. intersecting b. parallel<br>c. perpendicular d. horizontal |
| | | 7.3.2 | Sketch two lines that are parallel to each other |

COMPETENCY GOAL 7: The learner will identify and classify geometric figures and some of their parts.

Objectives Measures

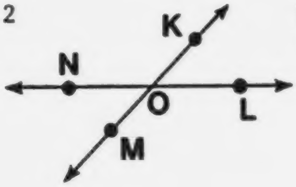
7.4 Identify acute, right, obtuse, and straight angles.

7.4.1 BOE is what kind of angle?



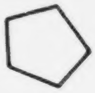
a. acute b. straight
c. obtuse d. right

7.4.2 Name an acute angle in this sketch.



7.5 Classify polygons.

7.5.1 What is the name of this polygon?



a. pentagon b. hexagon
c. octagon d. stellated triangle

7.5.2 Draw a sketch of a parallelogram.

7.6 Classify triangles according to the lengths of their sides.

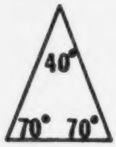
7.6.1 A triangle with two equal sides is called:

a. equilateral b. scalene
c. isosceles d. obtuse

7.6.2 Make a sketch of a scalene triangle and describe its most important characteristic.

7.7 Classify triangles according to the size of their angles.

7.7.1 Name the type of triangle from the information given:



a. right b. acute
c. obtuse d. scalene

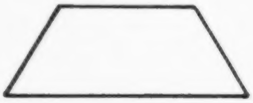
7.7.2 Draw a sketch of a right triangle and name its most important characteristic.

COMPETENCY GOAL 7: The learner will identify and classify geometric figures and some of their parts.

| Objectives | Measures |
|---|---|

7.8 Classify quadrilaterals (trapezoid, parallelogram, rhombus, rectangle, and square).

7.8.1 Name this figure:

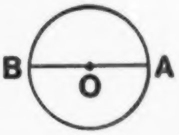


a. rectangle
b. parallelogram
c. square
d. trapezoid

7.8.2 Draw a sketch of a rectangle and list its important properties.

7.9 Identify parts of a circle (center, circumference, radius, diameter, arc, and chord).

7.9.1 In the circle shown below, $\overline{OA}$ is called a:

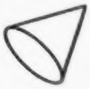


a. diameter
b. chord
c. radius
d. center

7.9.2 Draw a sketch of a circle and label the center O, a radius OP and a diameter ROS.

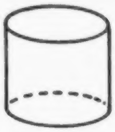
7.10 Identify space figures (rectangular, prism, cube, pyramid, cone, cylinder, and sphere).

7.10.1 This is a sketch of a:



a. cone
b. pyramid
c. cylinder
d. prism

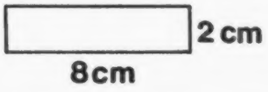
7.10.2 What is the name of the space figure shown below?



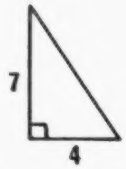
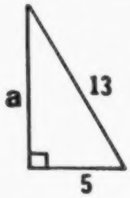
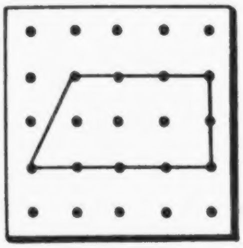
## MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: General Math

COMPETENCY GOAL 8: The learner will perform measurement tasks and solve related problems.

| | Objectives | | Measures |
|---|---|---|---|
| 8.1 | **Measure the length of an object to the nearest centimeter, decimeter, or meter.** | 8.1.1 | Measure the length of a standard $8\frac{1}{2}''$ x 11" sheet of paper to the nearest centimeter.<br>a. 27 cm b. 22 cm<br>c. 11 cm d. 28 cm |
| | | 8.1.2 | Measure the length of the classroom to the nearest meter. |
| 8.2 | **Measure the length of an object to the nearest half-inch, inch, foot, or yard.** | 8.2.1 | Measure the length of a meter stick to the nearest inch.<br>a. 39.4 inches b. 39 inches<br>c. 39.37 inches d. 3 feet |
| | | 8.2.2 | Measure the length of a dollar bill to the nearest half inch. |
| 8.3 | Find the perimeter of a polygon. | 8.3.1 | Find the perimeter:<br> <br>a. 16 $cm^2$ b. 10 cm<br>c. 20 cm d. 18 cm |
| | | 8.3.2 | Determine the perimeter of a square with each side 4 inches. |
| 8.4 | Use the formula $c = \pi d$ or $c = 2\pi r$ to find the circumference of a circle. Use a calculator when appropriate. | 8.4.1 | Determine the circumference of a circle with diameter of 10 inches. ($c = \pi d$, $\pi = 3.14$)<br>a. 31.4 inches b. 62.8 inches<br>c. 314 inches d. 6.28 inches |
| | | 8.4.2 | Determine the circumference of a circle whose radius is 0.5 meters. ($c = 2\pi$, $\pi = 3.14$) |

COMPETENCY GOAL 8: The learner will perform measurement tasks and solve related problems.

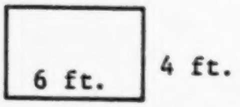
| | Objectives | | Measures |
|---|---|---|---|
| 8.5 | *Use the Pythagorean Theorem to determine the length of one side of a right triangle. Use a calculator when appropriate. | 8.5.1 | Use the Pythagorean Theorem to determine the missing side to the nearest tenth: (You may use a calculator).<br><br> <br>a. 8.06 b. 8.1 c. 8.0 d. 11 |
| | | 8.5.2 | What is the length of the missing side?<br><br> |
| 8.6 | Use tangrams, geoboard, or geodot paper to work with area problems. | 8.6.1 | What is the area of the shape shown on this geoboard surface? (A 1 x 1 square represents the unit of area.)<br><br>a. 10 sq. units b. 3 sq. units<br>c. 8 sq. units d. 7 sq. units |
| | | 8.6.2 | Examine a set of tangrams. If the area of one of the large triangles from this set is 4 square units, what is the area of the little square piece? |

COMPETENCY GOAL 8: The learner will perform measurement tasks and solve related problems.

| Objectives | Measures |
|---|---|

8.7 Use the formula $A = lw$ or $A = s^2$ to find the area of a rectangle or square. Use a calculator when appropriate.

8.7.1 Determine the area of this rectangle:



a. 20 sq. ft. b. 24 sq. ft.
c. 10 ft. d. none of these

8.7.2 What is the area of a square whose side is 15 cm?

8.8 Use the formula $A = \pi r^2$ to find the area of a circle. Use a calculator when appropriate.

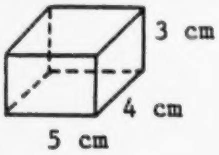
8.8.1. Find the area of a circle whose diameter is 20 centimeters. ($A = \pi r^2, \pi = 3.14$)

a. 314 $cm^2$ b. 62.8 $cm^2$
c. 125.6 $cm^2$ d. 1256 $cm^2$

8.8.2 Find the area of a circle whose radius is 2 feet.

8.9 Use the formula $V = lwh$ or $V = s^3$ to find the volume of a rectangular solid or cube. Use a calculator when appropriate.

8.9.1 Find the volume of the rectangular prism:

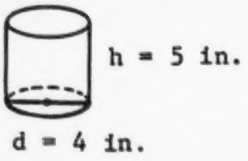


a. 12 $cm^3$
b. 23 $cm^3$
c. 60 $cm^3$
d. 94 $cm^3$

8.9.2 Find the volume of a cube which measures 4 inches along each edge.

8.10 Use the formula $V = \pi r^2 h$ to find the volume of a cylinder or sphere. Use a calculator when appropriate.

8.10.1 Find the volume of a large can of pork and beans with the following dimensions:

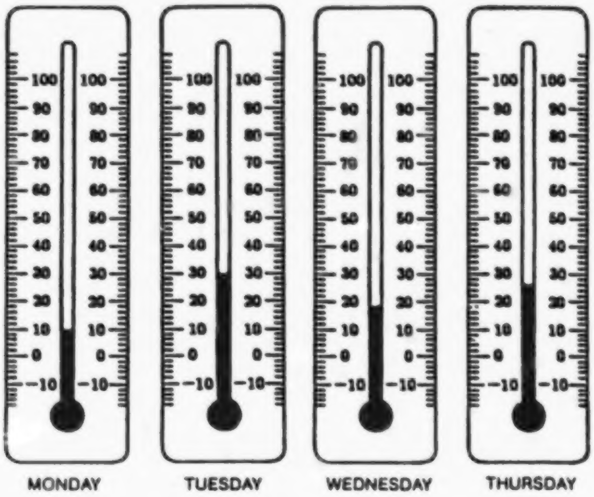


(Volume = $\pi r^2 h$; $\pi = 3.14$)

a. 20 cu. in.
b. 100 cu. in.
c. 251.2 cu. in.
d. 62.8 cu. in.

8.10.2 A child's rubber ball has a diameter of 4 inches. Determine the volume to the nearest hundredth. (Volume = $\frac{4}{3} \pi r^3$).

**COMPETENCY GOAL 8:** The learner will perform measurement tasks and solve related problems.

| Objectives | Measures |
|---|---|
| **8.11 Determine the difference between two times (elapsed time).** | 8.11.1 Sheila catches her school bus at 7:15 each morning and usually returns home at 3 p.m. How long is she gone from home on normal school days?<br>a. $8 \frac{3}{4}$ hours b. $7 \frac{3}{4}$ hours<br>c. $7 \frac{1}{4}$ hours d. $8 \frac{1}{4}$ hours |
| | 8.11.2 If you and friends arrived at the N.C. State Fair at 10:20 a.m. one morning and stayed until 11:30 p.m., how long would you be there? |
| **8.12 Determine temperature by reading a thermometer (Celsius or Fahrenheit). Possibly perform a related computation.** | 8.12.1 On what day was the second coldest temperature recorded?<br> <br>a. Monday b. Tuesday<br>c. Wednesday d. Thursday |
| | 8.12.2 What is the difference between the highest and lowest temperatures shown? |

MATHEMATICS

**Grade Level:** 9-12 **Skills/Subject Area:** General Math

**COMPETENCY GOAL 9:** The learner will interpret information displayed in tables, graphs, and scale drawings.

| Objectives | Measures |
|---|---|
| 9.1 Interpret information displayed in charts, tables, and diagrams. | 9.1.1 At what speed will you get the best gas mileage with this small car? |

| Speed (mph) | Gas Mileage (miles per gallon) |
|---|---|
| 25 | 39 |
| 35 | 40 |
| 45 | 42 |
| 55 | 44 |
| 60 | 41 |

a. 65 mph b. 55 mph
c. 45 mph d. 35 mph

9.1.2 When was it the warmest?

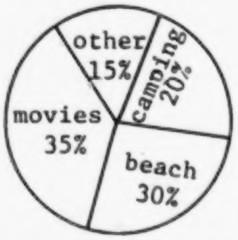
| Time | Temperature (F) |
|---|---|
| 9:00 | 67° |
| 11:00 | 78° |
| 1:00 | 83° |
| 3:00 | 81° |

COMPETENCY GOAL 9: The learner will interpret information displayed in tables, graphs, and scale drawings.

| Objectives | Measures |
|---|---|

9.2 Interpret information provided by bar, circle, line, and pictographs.

9.2.1 Recreation Time

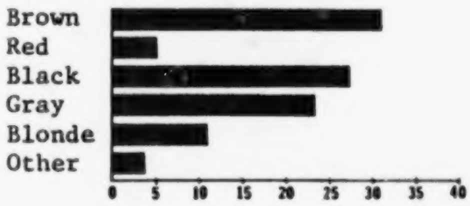


The most popular activity is:

a. beach b. camping
c. other d. movies

9.2.2 A survey of 100 people at a shopping mall revealed the following hair colors:

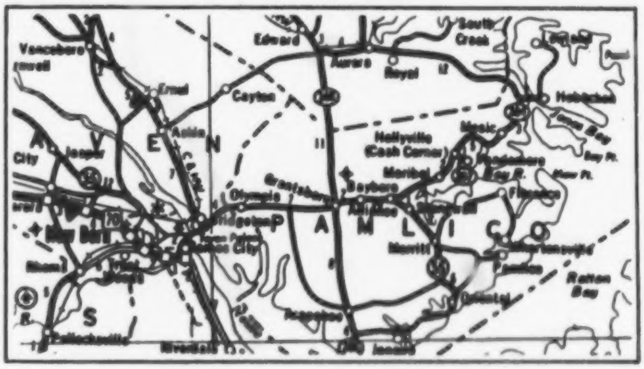
Hair Colors



According to the graph, what are the three most frequently found hair colors?

**COMPETENCY GOAL 9:** The learner will interpret information displayed in tables, graphs, and scale drawings.

| Objectives | Measures |
|---|---|
| 9.3 Interpret information provided by maps and other scale drawings. | 9.3.1 What is the highway distance from Araphahoe to Aurora? |


Vanceboro
Edward
Aurora
Royal
South Creek
Ernul
Cayton
Askin
Hobucken
Hollyville
(Cash Corner)
Mesic
Bayboro
Merritt
Rattan Bay
A
V
E
N
P
A
M
L
I
C
O
S
City
Jasper
70
Olympia
Arapahoe
Oriental

a. 19 miles b. 27 miles

c. 23 miles d. about $1\frac{1}{2}$ inches

9.3.2 Draw a floor plan of a 12 foot by 18 foot garage using the scale of $\frac{1}{2}$ inch = 1 foot.

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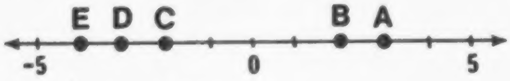
# MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: General Math

COMPETENCY GOAL 10: The learner will demonstrate an understanding of and perfrom operations with integers.

| Objectives | | Measures | |
|---|---|---|---|
| 10.1 | Give several examples where integers are used in everyday situations. | 10.1.1 | Select the example which does not use negative integers:<br>a. Number of children in your family<br>b. Very cold temperature<br>c. Lost yardage in a football game<br>d. A personal debt |
| | | 10.1.2 | Give three specific examples of how integers are useful in describing certain situations. |
| 10.2 | Locate the graph of an integer on a number line. | 10.2.1 | Which point is the graph of $^{-}3$ on this number line?<br><br> <br>a. A b. C c. D d. B |
| | | 10.2.2 | Draw a number line and name $^{-}4$ as point A, zero as point B, and $^{+}3$ as point C. |
| 10.3 | Add integers. | 10.3.1 | Add: $^{-}65 + (^{-}32)$<br>a. $^{-}97$ b. $^{-}33$ c. $^{+}33$ d. $^{+}97$ |
| | | 10.3.2 | Add: $^{-}37 + {}^{+}24$ |
| 10.4 | Subtract using integers. | 10.4.1 | Subtract: $^{+}9 - {}^{-}7$<br>a. 2 b. $^{-}2$ c. $^{-}16$ d. $^{+}16$ |
| | | 10.4.2 | Subtract: $^{-}9 - {}^{-}9$ |
| 10.5 | Compute the product of two integers. | 10.5.1 | Multiply: $^{-}4 \times (^{-}20)$<br>a. $^{-}24$ b. $^{+}80$ c. $^{+}24$ d. $^{-}80$ |
| | | 10.5.2 | Multiply: $54 \times (^{-}8)$ |

Skills/Subject Area: General Math

COMPETENCY GOAL 10: The learner will demonstrate an understanding of and perform operations with integers.

| Objectives | Measures |
|---|---|
| 10.6 Determine the quotient of two integers. | 10.6.1 Divide: 96 ÷ (-16)<br>a. -6 b. +80 c. +6 d. +112 |
| | 10.6.2 Divide: -600 ÷ (-12) |
| 10.7 Use integers to solve problems (both real and contrived). | 10.7.1 Randy kept good records of his gasoline costs for 2 months. He spent \$27.75 and \$27.50 for fuel. Use positive or negative numbers to show the total he spent.<br>a. \$2.25 b. -\$2.25<br>c. -\$57.25 d. \$57.25 |
| | 10.7.2 On a series of 4 plays, the East Carolina Pirates ran for 5 yards, lost 8 yards on a quarterback sack, had an incomplete pass, and completed a pass for 15 yards. What was the net gain (or loss) from these plays? |

## Technical Mathematics Outline

1. Whole Numbers and Integers

    a. Add, subtract, multiply, and divide.
    b. Estimate sums, differences, products, and quotients.
    c. Raise a number to a given power.
    d. Compare whole numbers and integers.
    e. Compute with integers.
    f. Use correct order of operations.
    g. Find the square root of a number using a table or a calculator.
    h. Solve problems.

2. Fractions

    a. Compare any two fractions.
    b. Compute with fractions and/or mixed numbers.
    c. Convert fractions to decimals.
    d. Express the comparison of two numbers as a ratio.
    e. Find the missing term of a proportion.
    f. Solve problems involving fractions and proportions.

3. Decimals

    a. Determine place value of digits in a decimal expression.
    b. Compare any two decimals.
    c. Add, subtract, multiply, and divide.
    d. Estimate sums, differences, products, and quotients by rounding.
    e. Use powers of ten in decimal expressions.
    f. Convert decimals to fractions.
    g. Find decimal, fraction, and percent equivalents.
    h. Solve problems involving decimals and percents.

4. Polynomials

    a. Use correct terminology.
    b. Add, subtract, and multiply monomials and polynomials.
    c. Use powers of monomials.
    d. Multiply monomials.
    e. Divide monomials.

5. Geometry

    a. Identify and classify lines and angles.
    b. Identify polygons and their properties.
    c. Identify circles and their properties.
    d. Perform basic geometric constructions.
    e. Solve problems involving geometric concepts.

6. Measurement

   a. Find the length, perimeter, and area of geometric figures.
   b. Find the mass of an object in customary and metric units.
   c. Find the volume/capacity of a quantity in metric and customary units.
   d. Convert and compare metric and customary units where necessary.
   e. Use denominate numbers.

7. Probability and Statistics

   a. Interpret and construct bar, line, and circle graphs.
   b. Use Cartesian coordinates to graph relations and functions.
   c. Interpret and construct maps and scale drawings.

8. Applications

   a. Use linear equations.
   b. Use formulas.
   c. Solve proportions.
   d. Use percent relationships.
   e. Apply the Pythagorean Theorem.
   f. Use right triangle trigonometry.

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

COMPETENCY GOAL 1: The learner will perform operations with whole numbers and integers.

| Objectives | | Measures |
|---|---|---|
| 1.1 Add, subtract, multiply and divide whole numbers. | 1.1.1 | Which pair of numbers has a sum of 124 and a product of 3588?<br>a) 45 and 78 b) 46 and 77<br>c) 45 and 77 d) 46 and 78 |
| | 1.1.2 | Divide 39,368 by 56. |
| 1.2 Estimate answers to whole number computations and check reasonableness of results. | 1.2.1 | A good estimate of the product of 491 and 72 is:<br>a) 2,800 b) 28,000<br>c) 3,500 d) 35,000 |
| | 1.2.2 | Estimate the difference between 596,344 and 87,120. |
| 1.3 Find the value of a number written with an exponent and use an exponent to indicate recurrent factors. | 1.3.1 | The value of $2^5$ is:<br>a) 32 b) 10 c) 25 d) 16 |
| | 1.3.2 | Write $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$ as a number raised to a power. |
| 1.4 Find the square root of a number (using a calculator for large numbers and nonperfect squares) and use in computations. | 1.4.1 | Without a calculator, evaluate $\sqrt{36} + \sqrt{16} + 2$.<br>a) $\sqrt{52}$ b) 10<br>c) 24 d) 12 |
| | 1.4.2 | Use a calculator to evaluate $\sqrt{5}$. |
| 1.5 Use < ,> , or a number line to compare integers. | 1.5.1 | Select the correct statement:<br>a) $-2 < -3 < -4$ b) $-2 < -3 > -4$<br>c) $-2 > -3 > -4$ d) $-2 > -3 < -4$ |
| | 1.5.2 | Draw a number line to show the relationship between the integers -2, -5, and 0. Then write the relationship using < or > symbols. |

COMPETENCY GOAL 1: The learner will perform operations with whole numbers and integers.

| Objectives | Measures |
|---|---|
| 1.6 Add integers. | 1.6.1 Add: -11 + 60<br>a) 71 b) -71<br>c) 49 d) -49 |
| | 1.6.2 Add: -82 + (-34) |
| 1.7 Subtract integers. | 1.7.1 Subtract: -20 - (-17)<br>a) -37 b) +37<br>c) +3 d) -3 |
| | 1.7.2 Subtract: 0 - (-14) |
| 1.8 Multiply integers | 1.8.1 Multiply -3 and -16.<br>a) 48 b) -48<br>c) 111 d) 19 |
| | 1.8.2 Multiply: (4) · (-18) · (-6) |
| 1.9 Divide integers. | 1.9.1 In the problem $\frac{?}{-2} = -10$ the missing number is:<br>a) 5 b) -5<br>c) 20 d) -20 |
| | 1.9.2 Divide: (-1250) ÷ (-25) |
| 1.10 Use the "order of operations" to simplify numerical expressions. | 1.10.1 Simplify the expression 20 + 20 ÷ 5 + 5.<br>a) 13 b) 29<br>c) 4 d) 22 |
| | 1.10.2 Evaluate $2(4 + 6)^2 - 10$. |

**COMPETENCY GOAL 1:** The learner will perform operations with whole numbers and integers.

| Objectives | Measures |
|---|---|
| 1.11 Solve word problems involving whole numbers and/or integers using a calculator when needed. | 1.11.1 A typographer set 7,840 lines of type one week and 6,972 lines the next week. How many more lines were set the first week?<br>a) 14,812 b) 1,132<br>c) 868 d) 13,712 |
|  | 1.11.2 Use a calculator to solve the following problem:<br>In 22 hours of driving time, the odometer on a car changed from a reading of 35,479 to 36,722 miles. Find the average rate in miles per hour. |

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

COMPETENCY GOAL 2: The learner will perform operations with fractional numbers.

| Objectives | Measures |
|---|---|
| **2.1 Write fractions equivalent to a given fraction by either simplifying or raising them to higher terms.** | 2.1.1 Find the missing numbers $\frac{\square}{16} = \frac{30}{32} = \frac{\square}{64}$<br>a) 32, 32 b) 15, 60<br>c) 60, 15 d) 15, 32<br>2.1.2 How many sixty-fourths are in $\frac{5}{32}$? |
| 2.2 Use $<$, $=$, $>$ or to compare fractions. | 2.2.1 Which of the following statements is true?<br>a) $\frac{1}{4} > \frac{1}{3}$ b) $\frac{3}{4} < \frac{2}{3}$<br>c) $\frac{3}{4} < \frac{1}{3}$ d) $\frac{3}{4} > \frac{2}{3}$<br>2.2.2 Use $<$ or $>$ to show the relationships among the fractions $\frac{5}{8}, \frac{7}{12}, \frac{2}{3}$. |
| 2.3 Change an improper fraction to a whole number or a mixed number and vice versa. | 2.3.1 Change $\frac{30}{12}$ to a mixed number in lowest terms.<br>a) $2\frac{8}{12}$ b) $2\frac{2}{3}$<br>c) $2\frac{1}{2}$ d) $2\frac{6}{30}$<br>2.3.2 Change $8\frac{3}{16}$ to an improper fraction. |
| 2.4 Add and subtract fractions and/or mixed numbers. | 2.4.1 Compute the following: $1\frac{1}{2} + 1\frac{3}{4} - 2\frac{1}{3}$<br>a) $\frac{11}{12}$ b) $1\frac{11}{12}$<br>c) 1 d) $\frac{9}{12}$<br>2.4.2 Find the difference: $2 - \frac{5}{64}$ |

**COMPETENCY GOAL 2:** The learner will perform operations with fractional numbers.

| Objectives | Measures |
|---|---|
| 2.5 Multiply and divide fractions and/or mixed numbers. | 2.5.1 Find the product of $5\frac{5}{8} \times \frac{3}{5} \times 4$ and give the answer in lowest terms.<br>a) $20\frac{15}{40}$ b) $20\frac{3}{8}$<br>c) $2\frac{7}{10}$ d) $13\frac{1}{2}$ |
| | 2.5.2 Compute the following $1\frac{7}{8} \div 7\frac{1}{2} \times 3$. |
| 2.6 Express a fraction or mixed number as a terminating or repeating decimal, using a calculator as needed. | 2.6.1 Change the fraction $\frac{1}{25}$ to decimal form.<br>a) 0.4 b) 0.04<br>c) 0.004 d) 0.14 |
| | 2.6.2 Use a calculator to convert $\frac{5}{1250}$ to a decimal. |
| 2.7 Solve problems involving fractional quantities, using a calculator as needed. | 2.7.1 Use a calculator to find the number of whole pieces, each using $3\frac{7}{16}$ inches, that may be cut from a bar 10 feet (120 inches) long.<br>a) 34 b) 35<br>c) 412 d) 413 |
| | 2.7.2 A carton containing cast iron brackets weighs $130\frac{3}{4}$ pounds. The empty carton weighs $4\frac{3}{4}$ pounds. Find the number of brackets in the carton if each weighs $2\frac{1}{4}$ pounds. |

COMPETENCY GOAL 2: The learner will perform operations with fractional numbers.

| Objectives | Measures |
|---|---|
| 2.8 Express the ratio of two quantities as a fraction and in at least one other form. | 2.8.1 Which of the following does not represent a ratio of 3 inches to 48 inches?<br>a) 3 : 48 b) $\frac{3}{48}$<br>c) $\frac{48}{3}$ d) $\frac{1}{16}$ |
|  | 2.8.2 The diameters of two pulleys are 400 millimeters and 250 millimeters. Compare the diameter of the larger pulley to the diameter of the smaller pulley and express this relationship as a ratio. |
| 2.9 Find the missing term in a proportion using a calculator when necessary. | 2.9.1 In the proportion $3\frac{1}{2} : 105 = 1{,}000 : ?$ the missing term is:<br>a) 3,000 b) 30,000<br>c) 367,500 d) 35,000 |
|  | 2.9.2 Use proportions and a calculator to solve the following problem:<br>The weight of 150 board feet of white pine is 297 pounds. Find the weight of 2,200 board feet of this wood. |

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

COMPETENCY GOAL 3: The learner will perform operations with decimal numbers.

| Objectives | Measures |
|---|---|
| 3.1 Identify the place value of digits in a given number and round to a specified place. | 3.1.1 Round 194.83576 to the nearest thousandth.<br>a) 194.8358 b) 194.84<br>c) 194.8 d) 194.836 |
| | 3.1.2 State the place value of each digit in the number 4.0675. |
| 3.2 Compare decimals and arrange in order by size. | 3.2.1 Given the following decimals 12.1, 12.01, 12.11, 12.101, 12.011, identify the smallest.<br>a) 12.1 b) 12.101<br>c) 12.01 d) 12.11 |
| | 3.2.2 Arrange the following decimals in order from smallest to largest:<br>0.8 0.88 0.08 0.808 0.088 |
| 3.3 Add and subtract decimals. | 3.3.1 Subtract 25.625 from 36.18.<br>a) 10.555 b) 10.565<br>c) 11.565 d) 0.565 |
| | 3.3.2 Evaluate 2 + 48.7 + 5.724 - 62.38. |
| 3.4 Multiply and divide decimals. | 3.4.1 Multiply 11.016 x 0.625.<br>a) 6.9475 b) 69.475<br>c) 6.885 d) 68.85 |
| | 3.4.2 Find the quotient of 48.84 ÷ 0.74. |
| 3.5 Estimate results of computations. | 3.5.1 The product of 3.62 x 4.8 will be:<br>a) between 16 and 20<br>b) less than 12<br>c) between 12 and 16<br>d) greater than 20 |
| | 3.5.2 Give an estimate of the quotient 80.9625 ÷ 6.35. |

COMPETENCY GOAL 3: The learner will perform operations with decimal numbers.

| Objectives | Measures |
|---|---|
| 3.6 Multiply and divide decimals by powers of ten. | 3.6.1 To multiply a decimal number by 1,000, the short-cut rule is:<br>a) Move the decimal point 4 places to the left.<br>b) Move the decimal point 4 places to the right.<br>c) Move the decimal 3 places to the left.<br>d) Move the decimal point 3 places to the right.<br>3.6.2 Use the short-cut rule to divide 38.72 by 10,000. |
| 3.7 Express a decimal number as a fraction. | 3.7.1 Change 0.625 to a fraction in simplest form.<br>a) $6\frac{1}{4}$ c) $\frac{5}{8}$<br>b) $\frac{625}{100}$ d) $\frac{1}{16}$<br>3.7.2 Change 0.012 to a common fraction. |
| 3.8 Express any decimal or fraction as a percent and vice versa. | 3.8.1 Express 0.0625 as a percent.<br>a) 0.00625% c) 6.25%<br>b) 625% d) 62.5%<br>3.8.2 Express 38% as a fraction in lowest terms. |
| 3.9 Write the two equivalent forms of fractions, decimals or percents when given a number in one form. | 3.9.1 The decimal and percent equivalents for the fraction $\frac{3}{8}$ are:<br>a) 0.0375 and 3.75% c) 3.75 and 375%<br>b) 0.375 and 3.75% d) 0.375 and 37.5%<br>3.9.2 Express $16\frac{2}{3}$ % as a common fraction and a decimal. |

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

COMPETENCY GOAL 4: The learner will perform operations with polynomials.

| Objectives | | Measures |
|---|---|---|
| 4.1 Identify special characteristics of polynomials, such as degree, coefficient, etc. | 4.1.1 | The degree of the polynomial $4x^3 + 4x^2 - 17x + 3$ is:<br>a) 5 c) 3<br>b) 6 d) 1 |
| | 4.1.2 | Explain why the expression $\frac{5}{x^2} - 7x + 11$ is not a polynomial. |
| 4.2 Simplify algebraic expressions by combining like terms. | 4.2.1 | Simplify the expression 4abh + 3abd - abh + 2abd.<br>a) 3abh + 5abd c) 4abh + 3abd<br>b) 7abh + abd d) 6abh + 2abd |
| | 4.2.2 | Combine like terms in the following expression:<br>$(+7x) - (-8y) + (+6) - (+4x) + (-2x) - (3y) + (-2y) + (-4)$ |
| 4.3 Add and subtract polynomials. | 4.3.1 | Add the following polynomials:<br>$(3x^2 - 5xy + 7y^2)$<br>$(a^2 + 3xy - x^2 - 4y^2)$<br>and $(4x^2 + 3 - 2a^2 - 3y^2)$<br>a) $6x^2 + 8xy + y^2 + 2a$<br>b) $6x^2 + 2xy - a^2$<br>c) $6x^2 - 2xy - a^2 + 3$<br>d) $6x^2 + 2xy + 3$ |
| | 4.3.2 | Combine the following polynomials:<br>$(4x^2 + 3xy - 2y^2)$<br>$+ (3y^2 - 2xy + x^2 - 5)$<br>$- (5xy - 4y^2 + x^2)$ |

| Objectives | Measures |
|---|---|
| 4.4 Raise a monomial to an indicated power. | 4.4.1 Simplify $(-2x^3y^2)^2$<br>a) $-2x^5 y^4$ c) $-4 x^6 y^4$<br>b) $2x^5 y^4$ d) $4 x^6 y^4$<br>4.4.2 Simplify $(3a^2 bx^3)^3$ |
| 4.5 Multiply a monomial by a monomial. | 4.5.1 Multiply $(-4x^2y^2)$ $(-3x^3y^4)$<br>a) $-12 x^5y^6$ c) $12 x^5y^6$<br>b) $12 x^5y^8$ d) $-12 x^5y^8$<br>4.5.2 Multiply $(3x^2y)$ $(4xy^3)$ $(2xy)$ |
| 4.6 Multiply a polynomial by a monomial. | 4.6.1 Multiply $-3(4x^2 - 5xy + 6y^2)$<br>a) $12x^2 - 15xy + 18y^2$<br>b) $-12x^2 + 15xy - 18y^2$<br>c) $12x^6 - 15x^3y^3 + 18y^6$<br>d) $-12x^6 + 15x^3y^3 - 18y^6$<br>4.6.2 Multiply $6m^3$ $(3m^2 + 4mx - 5x^2)$ |
| 4.7 Multiply a polynomial by a polynomial. | 4.7.1 The product of $7x + 5y$ and $4x - 3y$ is:<br>a) $28x^2 - xy - 15y^2$<br>b) $28x^2 - x^2y^2 - 15y^2$<br>c) $28x^2 + xy - 15y^2$<br>d) $28x^2 + x^2y^2 + 15y^2$<br>4.7.2 Multiply $(2 + 3x)$ $(6 - 5x + 4x^3)$ |

COMPETENCY GOAL 4: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 4.8 Use the rules of exponents to divide monomials. | 4.8.1 Divide $12x^6$ by $2x^3$<br>a) $6x^2$ c) $6x^9$<br>b) $6x^3$ d) $-6x^3$<br>4.8.2 Divide $(8x^2y^3z^5)$ by $(-2yz^3)$ |
| 4.9 Use the Order of Operations in simplifying algebraic expressions. | 4.9.1 Simplify $2x\,(3x^2 -5) + (-2x)^3$<br>a) $-10x$ c) $2x^3 - 10x$<br>b) $12x^3 - 10x$ d) $-2x^3 - 10x$<br>4.9.2 Simplify $3y(x + y) - \frac{15x^2y^3}{5xy^2}$ |

MATHEMATICS

**Grade Level:** 10-12　　**Skills/Subject Area:** Technical Mathematics

**COMPETENCY GOAL 5:** The learner will use linear equations, formulas, and proportions to solve problems.

| Objectives | Measures |
|---|---|
| 5.1 Use the Addition Property of Equality to solve a linear equation. | 5.1.1 Solve the equation $d - \frac{1}{16} = 8\frac{1}{2}$.<br>a) $8\frac{7}{16}$　b) $\frac{7}{16}$<br>c) $8\frac{9}{16}$　d) $\frac{9}{16}$<br>5.1.2 Solve the equation $t + 5\frac{3}{4} = 7.25$. |
| 5.2 Use the Multiplication and Division Properties of Equality to solve a linear equation. | 5.2.1 Solve the equation $4.125 = 0.3\,m$.<br>a) 1.2375　b) 12.375<br>c) 1.375　d) 13.75<br>5.2.2 Solve the equation $\frac{x}{6.2} = 15$. |
| 5.3 Use more than one property of equality to solve a linear equation. | 5.3.1 Solve the equation $12 + \frac{m}{3} = 14$.<br>a) $\frac{2}{3}$　b) $8\frac{2}{3}$　c) 6　d) 26<br>5.3.2 Solve the equation $3(a+6) = 24$. |
| 5.4 Write proportions as equations and solve for the missing term, using a calculator as needed. | 5.4.1 Solve for x in the proportion $\frac{0.7}{x} = \frac{4}{0.08}$.<br>a) 0.014　b) 0.14<br>c) 1.4　d) 14<br>5.4.2 Solve for x in the proportion $0.03 : 2\frac{1}{2} = x : 0.275$. |

COMPETENCY GOAL 5: The learner will use linear equations, formulas, and proportions to solve problems.

| Objectives | Measures |
|---|---|
| **5.5 Substitute known values into a formula and solve for the unknown quantity, using a calculator when needed.** | 5.5.1 Find the value of A in the formula $A = 3.14\ (r-d)$ when $r = 3.2$ and $d = 3.0$.<br>a) -.628 b) 0.628<br>c) 6.28 d) -6.28 |
|  | 5.5.2 Find the value of A in the formula $A = \frac{(a+b)\ h}{2}$ when $a = 6.6$, $b = 7.2$ and $h = 11$. |
| **5.6 Solve for a specified variable in a given formula.** | 5.6.1 Solve for P in the formula $S = \frac{P + 2}{F}$.<br>a) $P = SF + 2$ b) $P = S + F + 2$<br>c) $P = SF - 2$ d) $P = S + F - 2$ |
|  | 5.6.2 Solve for w in the formula $L = 7.4d + 2w$. |
| **5.7 Solve percentage formulas of the type $P = RB$ involving problems such as discount, commission, tax, etc.** | 5.7.1 A tax of 9.6% is paid on an income of $12,440. How much tax is paid?<br>a) $11,942.40 b) $1,194.24<br>c) $ 119.42 d) $1,295.83 |
|  | 5.7.2 The labor cost for making a part is 29¢. The retail selling price of the part is $1.16. The labor cost is what percent of the selling price? |

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

**COMPETENCY GOAL 6:** The learner will develop skills and concepts of geometry and simple geometric constructions.

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Objectives | Measures

**6.1 Classify angles as acute, obtuse or right.**

6.1.1 An angle whose measure is 75 degrees is called:

a) obtuse b) acute

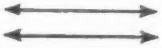
c) right d) central

6.1.2 An acute angle has measure less than _____degrees.

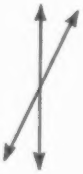
6.2 Classify lines and their relationships such as parallel, intersecting and perpendicular.

6.2.1 Which of the following are perpendicular lines?

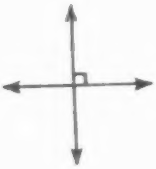
a)



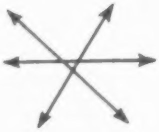
b)



c)

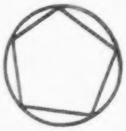


d)

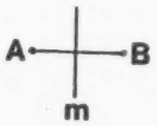
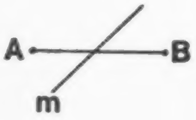
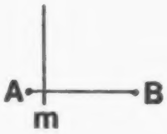
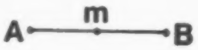
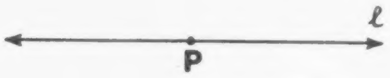


6.2.2 Lines in the same plane which do not intersect are called _________.

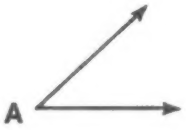
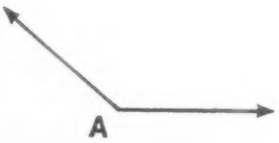
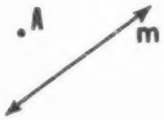
COMPETENCY GOAL 6: The learner will develop skills and concepts of geometry and simple geometric constructions.

| Objectives | Measures |
|---|---|
| 6.3 Identify terms related to circles such as radius, center, diameter, and chord. | 6.3.1 The distance from the center of a circle to a point on the circle is called the:<br>a) radius b) diameter<br>c) chord d) area |
| | 6.3.2 In a given circle draw a radius, a chord, and a diameter. |
| 6.4 Identify types of polygons such as convex, concave, inscribed, regular. | 6.4.1 Which of the following terms applies to the polygon shown?<br><br>a) regular b) concave<br>c) circumscribed d) hexagon |
| | 6.4.2 A polygon with exactly five sides is called a__________. |
| 6.5 Recognize types of triangles and their properties. | 6.5.1 Which is not a type of triangle?<br>a) acute b) scalene<br>c) right d) concave |
| | 6.5.2 The sum of the measures of the angles of a triangle is _______degrees. |
| 6.6 Recognize types of quadrilaterals and their properties | 6.6.1 Which of the following terms do not apply to a rectangle?<br>a) quadrilateral b) hexagon<br>c) parallelogram d) regular polygon |
| | 6.6.2 A quadrilateral with only one pair of sides parallel is called a ________. |

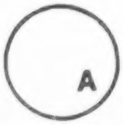
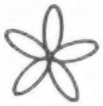
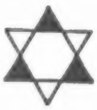
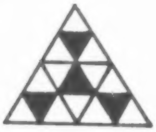
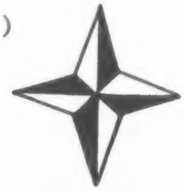
COMPETENCY GOAL 6: The learner will develop skills and concepts of geometry and simple geometric constructions.

| Objectives | Measures |
|---|---|
| 6.7 Construct a perpendicular bisector of a segment. | 6.7.1 Which of the following shows a perpendicular bisector of segment AB?<br>a) <br>b) <br>c) <br>d) <br>6.7.2 Given segment AB, construct its perpendicular bisector. |
| 6.8 Construct a perpendicular to a line at a point on the line and from a point not on the line. | 6.8.1 In constructing a perpendicular to a line from a point not on the line, the first placement of the compass needle is at:<br>a) The end of the line<br>b) The midpoint of the line<br>c) The point<br>d) Halfway between the point and the line.<br>6.8.2 Given line ℓ containing point P, construct a perpendicular to ℓ at P.<br> |

COMPETENCY GOAL 6: The learner will develop skills and concepts of geometry and simple geometric constructions.

| Objectives | Measures |
|---|---|
| 6.9 Construct the bisector of an angle. | 6.9.1 A bisector of an angle is:<br>a) a point b) an arc<br>c) a ray d) another angle<br>6.9.2 Construct the bisector of angle A.<br><br> |
| 6.10 Construct an angle congruent to a given angle. | 6.10.1 The first step in the construction of an angle congruent to a given angle is:<br>a) Draw a working line<br>b) Measure the angle<br>c) Draw an arc<br>d) Place a point on one ray of the angle<br>6.10.2 Construct an angle congruent to a given obtuse angle.<br><br> |
| 6.11 Construct a line parallel to a given line through a point not on the line. | 6.11.1 To construct a line parallel to a given line you must:<br>a) Bisect the line<br>b) Measure the line<br>c) Place two points on the line<br>d) Draw a second line to intersect the given line.<br>6.11.2 Construct a line parallel to m and passing through point A.<br><br> |

COMPETENCY GOAL 6: The learner will develop skills and concepts of geometry and simple geometric constructions.

| Objectives | Measures |
|---|---|
| 6.12 Find the center of a circle by construction. | 6.12.1 To use construction to find the center of a circle you should:<br>a) Measure the circumference<br>b) Draw a diameter<br>c) Bisect an arc of the circle<br>d) Bisect two non-parallel chords<br>6.12.2 Use the construction to locate the center of circle A:  |
| 6.13 Construct regular inscribed polygons. | 6.13.1 In construction of a regular inscribed octagon:<br>a) The length of one side of the octagon is equal to the radius of the circle.<br>b) All the sides lie outside the circle.<br>c) All the vertices lie on the circle.<br>d) The sides will be of different lengths.<br>6.13.2 Construct a regular inscribed pentagon. |
| 6.14 Construct original designs. | 6.14.1 Which of the following designs is based on the hexagon?<br>a) <br>b) <br>c) <br>d) <br>6.14.2 Draw an original design based on the construction of a regular inscribed octagon. |

## MATHEMATICS

**Grade Level:** 10-12 **Skills/Subject Area:** Technical Mathematics

**COMPETENCY GOAL 7:** The learner will use and read measuring devices and solve problems involving the U.S. Customary and Metric Systems of Measurement.

**Objectives** **Measures**

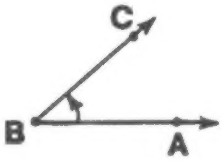
7.1 Read and use measuring devices such as scales, rulers, protractors, meters, micrometers, and thermometers.

7.1.1 To measure the diameter of a small cylindrical bolt you would use:

a) a ruler b) a compass

c) a micrometer d) a protractor

7.1.2 Measure the following angle to the nearest degree:



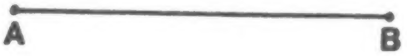
7.2 Measure lengths in both metric and customary units.

7.2.1 Which unit is a measure of length?

a) kilogram b) liter

c) degree d) decimeter

7.2.2 Use a ruler to measure segment AB to the nearest one-eighth inch:



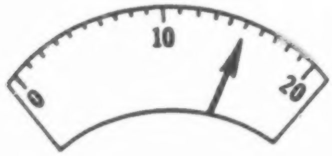
7.3 Measure mass (weight) in both metric and customary units.

7.3.1 Which unit is a measure of mass (weight)?

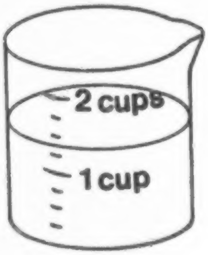
a) kiloliter b) milligram

c) quart d) meter

7.3.2 Read the following to the nearest pound:



**COMPETENCY GOAL 7:** The learner will use and read measuring devices and solve problems involving the U.S. Customary and Metric Systems of Measurement.

| Objectives | Measures |
|---|---|
| 7.4 Measure volume in both metric and customary units. | 7.4.1 Which is not a unit used to measure volume?<br>a) pint b) ton<br>c) centiliter d) gallon<br>7.4.2 Read the following to the nearest half cup:<br> |
| 7.5 Convert units of measure within the metric system to smaller or larger units of measure. | 7.5.1 A measure of three meters is equivalent to:<br>a) 30 kilometers<br>b) 300 centimeters<br>c) 0.003 millimeters<br>d) 0.33 decimeter<br>7.5.2 Change 1.07 centigrams to milligrams. |
| 7.6 Write from memory commonly used measurement conversion factors for standard units of measure. | 7.6.1 One mile is equal to:<br>a) 5,280 feet b) 1,000 paces<br>c) 10 acres d) 1,000 yards<br>7.6.2 One gallon is equal to _____quarts. |
| 7.7 Convert units of measure within the customary system to smaller or larger units of measure. | 7.7.1 $2\frac{1}{3}$ yards is equal to:<br>a) 75 inches b) 84 inches<br>c) 5 feet d) $\frac{7}{3}$ feet<br>7.7.2 Fifteen and one half pounds equals ________ounces. |

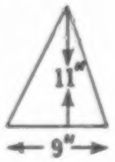
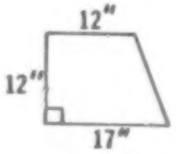
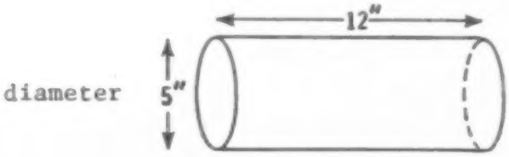
**COMPETENCY GOAL 7:** The learner will use and read measuring devices and solve problems involving the U.S. Customary and Metric Systems of Measurement.

| Objectives | Measures |
|---|---|
| 7.8 Compare units of measure between the metric and customary systems of measurement. | 7.8.1 A measure of two liters is approximately equal to:<br>a) one pint b) $\frac{1}{2}$ gallon<br>c) six quarts d) four tablespoons<br>7.8.2 Which is longer, 6 meters or 6 yards? |
| 7.9 Use appropriate units of measure to estimate various quantities in either metric or customary systems. | 7.9.1 The height of a professional basketball player might be:<br>a) 2 meters b) 2 centimeters<br>c) 2 kilometers d) 2 millimeters<br>7.9.2 Is it reasonable to expect the maximum capacity of a 'compact' auto fuel tank to be 600 pints? Explain your answer. |
| 7.10 Solve problems involving denominate numbers, using calculators as needed. | 7.10.1 Four pounds six ounces added to three pounds twelve ounces is equal to:<br>a) eight pounds six ounces<br>b) 128 ounces<br>c) seven pounds two ounces<br>d) eight pounds two ounces<br>7.10.2 (7 ft. 3 in.) - (2 ft. 11 in.) = _____ |
| 7.11 Use proportions and calculators to solve measurement problems involving conversions. | 7.11.1 If one quart equals 32 fluid ounces, 1800 fluid ounces would be equal to approximately:<br>a) 14 gallons b) 225 pints<br>c) 225 gallons d) 28 pints<br>7.11.2 If one acre =43,560 square feet, how many acres are in 152,460 square feet? |

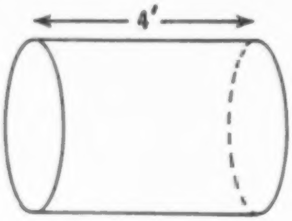
MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

COMPETENCY GOAL 8: The learner will solve problems involving perimeter, area, and volume.

| Objectives | Measures |
|---|---|
| 8.1 Find the perimeter and/or circumference of the following shapes: square, rectangle, circle, triangle, trapezoid. | 8.1.1 If the length of a rectangle is 7" and the width is 3", then the perimeter is:<br>a) 10 inches b) 21 inches<br>c) 20 inches d) 40 inches<br>8.1.2 If the radius of a circle is 3.5 inches, then the circumference is __________. (Use π = 3.14) |
| 8.2 Find the area of various shapes including squares, rectangles, triangles, circles, trapezoids, and the surface area of rectangular solids and cylinders. | 8.2.1 The area of the triangle is:<br>(height = 11 in.)<br>(base = 9 in.)<br><br> <br>a) 49.5 sq. in. b) 99 sq. in.<br>c) 20 sq. in. d) 60 sq. in.<br>8.2.2 Find the area of the trapezoid shown:<br><br> |
| 8.3 Find the volume of various shapes including cylinders, spheres, rectangular solids, cones, pyramids. | 8.3.1 The volume of a sphere whose diameter is 2 feet is:<br>a) 16.76 cu. ft. b) 33.51 cu. ft.<br>c) 4.19 cu. ft. d) 12.57 cu. ft.<br>8.3.2 Find the volume of the cylinder below:<br><br> |

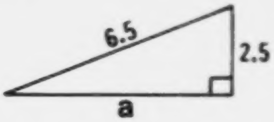
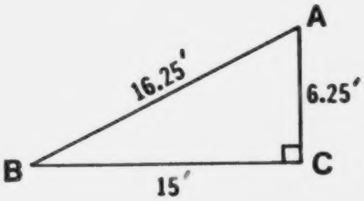
COMPETENCY GOAL 8: The learner will solve problems involving perimeter, area and volume.

| Objectives | Measures |
|---|---|
| 8.4 Use formulas and properties of equality to solve for an unknown dimension of a given shape when the perimeter, area or volume is known. | 8.4.1 If the circumference of a given circle is 53.38 inches, find the radius.<br>$C = 2\pi r$<br>a) 17 inches b) 26.69 inches<br>c) 8.5 inches d) 4.12 inches<br>8.4.2 If the volume of a right circular cylinder is 235.5 cu. ft., and the radius is 2.5 feet, what is the length of the cylinder? ($V = \pi r^2 h$) |
| 8.5 Use formulas to solve problems involving perimeter, area or volume, using a calculator as needed. | 8.5.1 The volume of the pyramid with height 5" and rectangular base dimensions of 3" and 2" is:<br>a) 30 cu. in. b) 10 cu. in.<br>c) 25 cu. in. d) 21 cu. in.<br>8.5.2 If one gallon equals 278 cubic inches, how many gallons are in the tank pictured below when the tank is half full?<br><br> <br>circumference = 9.42 feet |

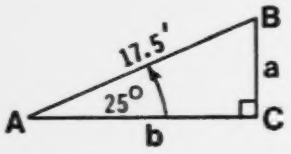
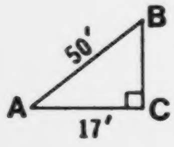
MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

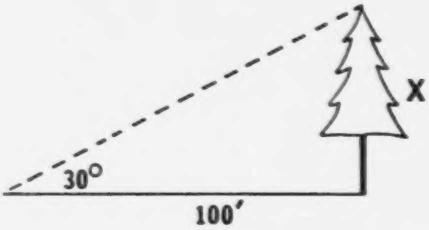
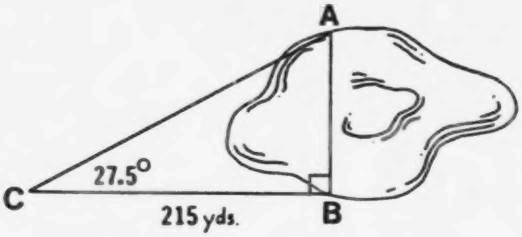
COMPETENCY GOAL 9: The learner will use the Pythagorean Theorem and right triangle trigonometry to solve problems.

| Objectives | Measures |
|---|---|
| 9.1 Use the Pythagorean Theorem to find the missing side of a right triangle. | 9.1.1 In the Pythagorean Theorem, $a^2 + b^2 = c^2$, if a and b are 4.5' and 6' respectively, then the length of the hypotenuse is:<br>a) 7.5' b) 10.5'<br>c) 56.25' d) 110.25'<br>9.1.2 Find the length of side a in the triangle shown:<br><br> |
| 9.2 Use the converse of the Pythagorean Theorem to prove that a triangle is a right triangle. | 9.2.1 Which of the following sets of segments could be the sides of a right triangle?<br>a) a = 3, b = 4, c = 5<br>b) a = 1, b = 2, c = 3<br>c) a = 4, b = 9, c = 13<br>d) a = 1, b = 4, c = 9<br>9.2.2 Given ΔABC with sides a = 3.75", b = 5", c = 6.25", is ΔABC a right triangle? |
| 9.3 State the six trigonometric functions as ratios of the sides of a right triangle and compute their values when given the lengths of the sides of the triangle. | 9.3.1 In a right triangle, the ratio, of $\frac{\text{opposite side}}{\text{hypotenuse}}$, is called the:<br>a) cosine b) tangent<br>c) cosecant d) sine<br>9.3.2 Find the tangent of angle A for the triangle shown below:<br><br> |

**COMPETENCY GOAL 9:** The learner will use the Pythagorean Theorem and right triangle trigonometry to solve problems.

| Objectives | Measures |
|---|---|
| 9.4 Find the value of trigonometric ratios for a given angle, using a calculator as needed. | 9.4.1 A calculator will show the sine of $30^\circ$ to be approximately:<br>a) 2,000 b) 0.866<br>c) 0.500 d) 0.577<br>9.4.2 $\tan 15.45^\circ = ?$ |
| 9.5 Find the angle for a given trigonometric ratio, using a calculator as needed. | 9.5.1 If $\cos A = 0.7660$ then $\angle A = ?$<br>a) $0.999^\circ$ b) $50^\circ$<br>c) $40^\circ$ d) $37.452^\circ$<br>9.5.2 If $\sin A = 0.7071$, then $\angle A =$ _____ degrees. |
| 9.6 Use trigonometric ratios to find the missing parts of a right triangle, using a calculator as needed. | 9.6.1 Given $\triangle ABC$ as shown, which of the following is correct?<br><br> <br>a) a = 7.4' b) a = 15.9'<br>c) a = 8.2' d) a = 41.4'<br>9.6.2 Solve the given triangle for angle B.<br><br> |

COMPETENCY GOAL 9: The learner will use the Pythagorean Theorem and right triangle trigonometry to solve problems.

| Objectives | Measures |
|---|---|
| 9.7 Use trigonometry or proportions, to solve problems involving inaccessible distances, using a calculator as needed. | 9.7.1 Which ratio could best be used to solve for the height of the tree in figure A?<br> <br>a) sine b) cosecant<br>c) tangent d) cosine |
|  | 9.7.2 Find the distance across the pond represented in the drawing below: (From point A to point B)<br> |

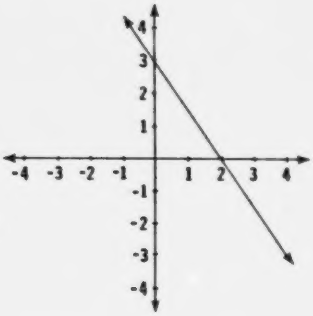
## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Technical Mathematics

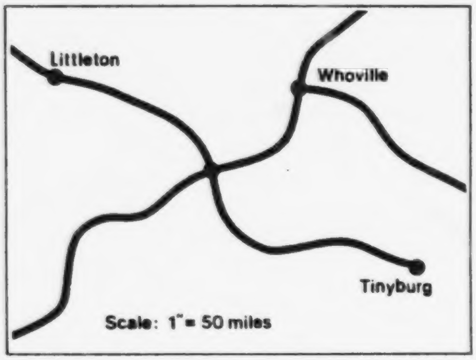
COMPETENCY GOAL 10: The learner will interpret and/or construct graphs, draw inferences from them, and use the information to solve problems.

| Objectives | Measures |
|---|---|
| 10.1 Read and interpret bar, circle, and line graphs. | 10.1.1 Locate a line graph in a newspaper or magazine. Interpret its contents to classmates. |
| | 10.1.2 Locate a circle graph in a newspaper or magazine. Read and interpret the information presented to others in the class. |
| 10.2 Organize and present data in a graphical form. | 10.2.1 Prepare a bar graph which shows the relative differences in cost between a new and rebuilt part if the new part costs $10 and the rebuilt part costs $5? |
| | 10.2.2 Prepare a circle graph showing the following family budget:<br>Utilities...........$ 90.00<br>Rent................ 120.00<br>Food................ 90.00<br>Other............... 60.00 |
| 10.3 Use data depicted in graphical form to solve problems and make predictions. | 10.3.1 Using the data presented on a line graph, answer various questions about it and be able to make predictions related to it. |
| | 10.3.2 From information presented in a circle graph, solve problems related to it and predict future outcomes or conditions. |

COMPETENCY GOAL 10: The learner will interpret and/or construct graphs, draw inferences from them, and use the information to solve problems.

| Objectives | Measures |
|---|---|
| 10.4 Use the Cartesian coordinate system to plot points. | 10.4.1 Using the Cartesian coordinate system, the point represented by $(-3, 2\frac{1}{4})$ would be located:<br>a) in Quadrant III<br>b) in Quadrant II<br>c) in Quadrant IV<br>d) on the x-axis<br>10.4.2 Plot the following points using the Cartesian coordinate system:<br>$(-2, -1)$, $(0, 2)$, $(-3, 0)$, $(4, -5)$, $(-5\frac{1}{2}, 2\frac{1}{2})$ |
| 10.5 Graph a linear equation in two variables using Cartesian coordinates. | 10.5.1 Which line is represented by the graph shown?<br> <br>a) $y = -\frac{3}{2}x$<br>b) $2y - 3x - 4 = 0$<br>c) $3x + 2y - 6 = 0$<br>d) $3x + 2y - 12 = 0$<br>10.5.2 Graph the line represented by the equation $2x - y + 4 = 0$. |

COMPETENCY GOAL 10: The learner will interpret and/or construct graphs, draw inferences from them, and use the information to solve problems.

| Objectives | Measures |
|---|---|
| **10.6 Read and interpret scale drawings and maps using a calculator for making conversions when needed.** | 10.6.1 If a map uses a scale of 1 inch = 150 miles, then a length of $2\frac{1}{4}$ inches on the map represents an actual distance of:<br>a) 337.5 miles b) 66.7 miles<br>c) 300.25 miles d) 75.25 miles<br>10.6.2 On the map shown below, use a ruler and the given scale to determine the actual distance from Littleton to Tinyburg (as the crow flies).<br> |
| 10.7 Produce a scale drawing from actual dimensions. | 10.7.1 A scale drawing is to be made of a tract of land and the drawing must fit on 8½" x 11" paper. Choose an approximate scale if the dimensions of the tract are 200 feet by 125 feet.<br>a) 1" = 10' b) 1" = 400'<br>c) 1" = 5' d) 1" = 25'<br>10.7.2 Using a scale of $\frac{1}{4}$ inch = 200 feet, how long must a scaled segment be to represent an actual distance of 172.5 feet? |

COMPETENCY GOAL 10: The learner will interpret and/or construct graphs, draw inferences from them, and use the information to solve problems.

| Objectives | | Measures | |
|---|---|---|---|
| *10.8 | **Graph a linear inequality in two variables on a rectangular coordinate plane.** | *10.8.1 | The graph of $y > \frac{3}{4}x - 2$ is represented by:<br>a) A line with y-intercept (0, -2) and slope $\frac{3}{4}$, and also the half plane below the line.<br>b) A line with slope $\frac{3}{4}$ and y-intercept (0, -2), and also the half plane above the line.<br>c) The half plane above but not including a line with slope $\frac{3}{4}$ and y-intercept (0, -2).<br>c) The half plane below but not including a line with slope $\frac{3}{4}$ and y-intercept (0, -2). |
| | | *10.8.2 | Sketch the graph of $2x - 3y + 6 < 0$. |

10.8 * (Optional)

## Consumer Mathematics Outline

1. Banking

   a. Complete deposit slips and checks.
   b. Reconcile bank statements.
   c. Use a table to find the interest on a simple interest loan.
   d. Use a compound interest table to find the interest on a loan.

2. Consumer Credit

   a. Complete a credit application.
   b. List the various types of credit plans.
   c. Determine the cost of credit insurance.

3. Housing

   a. Determine how down payments are set.
   b. Use a mortgage loan schedule.
   c. Compute property tax.
   d. Compute the insurance premium on a house.
   e. Compute utility bills.
   f. Compare renting to buying.

4. Insurance

   a. Compute and compare term and whole life insurance.
   b. Use a premium rate table to find the annual premium on various types of insurance.
   c. Compute hospitalization insurance.
   d. Determine property insurance.

5. Probability and Statistics

   a. Interpret bar, circle, and line graphs.
   b. Find the mean, median, and mode of a set of data.
   c. Compute the range of a set of data.

6. Money Management

   a. Compute piecework wages.
   b. Compute using hourly wage and overtime.
   c. Determine commission on sales.
   d. Find the cost of installment buying.
   e. Compute discounts.
   f. Compute social security deductions.

7. Savings and Investments

   a. Compare compound interest accounts and simple interest accounts.
   b. Compare a regular savings account and a certificate of deposit.
   c. Compute dividends on savings.
   d. Cite advantages and disadvantages of buying stock.

8. Sales and Income Tax

   a. Solve related problems.

9. Transportation

   a. Determine the down payment and monthly payment when purchasing a vehicle.
   b. Compute bodily injury and property damage insurance.
   c. Know how deductible collision insurance works.
   d. Calculate fuel consumption.
   e. Use the distance formula to determine the average speed, time, or distance when given the other two entries.

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Consumer Mathematics

COMPETENCY GOAL 1: The learner will solve problems related to how banks serve consumers.

| Objectives | Measures |
|---|---|
| 1.1 "Open" an account. | 1.1.1 Sue Smith would like to open a checking account. Her banker tells her that in order to do this she must make a deposit. This means Sue must:<br>a) Fill out a personal information sheet.<br>b) Give the banker money to put into the new account.<br>c) Take all her money and put it in a safety deposit box.<br>d) Discuss her personal finances with the banker. |
| | 1.1.2 State one good reason for opening and maintaining a checking account. |
| 1.2 Complete a deposit slip. | 1.2.1 Ray Rodriquez has the following checks to deposit in his account: $23.78, $142.51, $468.21. Ray wants $50.00 in cash. Ray's net deposit on his deposit slip will be:<br>a) $684.50 b) $ 50.00<br>c) $634.50 d) $584.50 |
| | 1.2.2 Tonya Smith has $63.75 in cash and the following checks to deposit in her account: $102.75 and $1,023.70. Complete a deposit slip for Tonya to use in making this transaction. |

COMPETENCY GOAL 1: The learner will solve problems related to how banks serve consumers.

| Objectives | Measures |
|---|---|
| 1.3 Determine the cost of maintaining various types of checking accounts (flat-payment plan, special checking account, analysis plan). | 1.3.1 The First National Bank charges $.75 a month plus $.12 for each check written if the minimum balance is under $300. During November, Fred wrote 18 checks and had a minimum balance of $103.75. Fred's service charge for November was:<br>a) $2.91 b) $2.16<br>c) $5.76 d) $8.65<br>1.3.2 Sam has a special checking account that costs him 20¢ per check written. If he keeps a minimum balance of $300 per month in his account, he could have a regular checking account with no service charge. Sam writes an average of 15 checks per month. He earns $25 interest per year on the $300 in a savings account. Should Sam transfer the money and open a regular checking account? Explain your answer. |
| 1.4 Write a check. | 1.4.1 Cid would like to write a check for $72.54. How should $72.54 be written in words on a check?<br>a) 72 and 54/100 dollars<br>b) Seventy 2 and 54/100 dollars<br>c) Seventy-two and 54/100 dollars<br>d) Seventy-two and fifty-four dollars<br>1.4.2 Write a check to the Food Fresh Grocery Store for the amount of $122.62. |

Skills/Subject Area: Consumer Mathematics

COMPETENCY GOAL 1: The learner will solve problems related to how banks serve consumers.

| Objectives | Measures |
|---|---|

1.5 Complete a check stub or checkbook record.

1.5.1 On your check stub, the balance brought forward was $632.86. A deposit of $316.82 was made since the last check was written. You are now writing a check for $218.19. Find the balance carried forward to the next check stub.

a) $ 97.85    b) $534.23

b) $1,167.87    d) $731.49

1.5.2 Given a balance of $684.23 and the following activities, complete a checkbook record.

Jan. 11th - Check to Friendly Grocery for groceries in the amount of $132.16, check #105.

Jan. 12th - Check to Footloose Shoe Store for shoes in the amount of $46.87, check #106.

Jan. 15th - Deposit paycheck, amount $1,282.63.

Jan. 18th - Check to Farmer Real-Estate for rent, amount $350.00, check #107.

1.6 Reconcile a checking account statement.

1.6.1 Some checks that have been subtracted from the checkbook record may not yet have been cashed by the payees. These checks are called:

a) Late checks    b) Cancelled checks

b) Outstanding checks    d) Debits

1.6.2 Reconcile the check record balance with the bank statement balance using the following information:

Checks outstanding: $32.86
$58.21
$40.12
Deposits not recorded on bank statement:
$159.17

Service charges: $ .72

Bank statement balance: $737.22

COMPETENCY GOAL 1: The learner will solve problems related to how banks serve consumers.

| Objectives | Measures |
|---|---|
| 1.7 Endorse a check. (Restricted, full, qualified, and blank endorsement). | 1.7.1 Sue Goldstein receives a check in payment and wants to mail it to the bank. Which type of endorsement should Sue use on her check?<br>a) Restricted<br>b) Full<br>c) Qualified<br>d) Blank endorsement |
| | 1.7.2 Steve Jensen paid Cam Edwards $15.65 by check. Cam Edwards owes Joe Morrison $15.65 and wishes to pay the debt with the check he received from Steve Jensen. What will Cam have to write on the back of his check? |
| 1.8 Use the simple interest formula to find the simple interest when given the principal, rate, and time. | 1.8.1 Edward Zaleski borrowed $300 from Carolina Power and Light to install energy saving storm windows on his home. How much interest will he pay on his loan for one year at the interest rate of 6%?<br>a) $1,800.00 b) $180.00<br>c) $ 18.00 d) $ 9.00 |
| | 1.8.2 Edith Stein has on deposit at the First National Bank $10,286. First National is currently paying 9.5% annually on simple interest accounts. Find her interest after six months. |
| 1.9 Find the amount to be repaid when a loan is obtained with simple interest. | 1.9.1 Juanita Vasquez has an unpaid balance of $62.65 from last month on her charge account at Beauty Fine Clothing. She pays 1.5% interest on the unpaid balance each month. What is her new unpaid balance?<br>a) $ 72.05 b) $156.63<br>c) $156.62 d) $ 63.59 |
| | 1.9.2 Nancy Brown borrowed $1,250 at 12% simple interest for two years. How much did she owe after two years? |

COMPETENCY GOAL 1: The learner will solve problems related to how banks serve consumers.

| Objectives | | Measures | |
|---|---|---|---|
| 1.10 | Use a simple interest table to find the simple interest when given the principal. | 1.10.1 | Using a simple interest table, Joe Fitzpatrick computes the interest he will pay on a loan of $500 over a period of 90 days at 10% interest. Which amount below is the interest on Joe's loan?<br>a) $2.50 b) $12.50<br>c) $8.33 d) $ 7.50 |
| | | 1.10.2 | Use a simple interest table to compute the interest on a loan of $652 at an annual interest rate of 13% for three days. |
| 1.11 | Use a compound interest table to determine how much interest a consumer's money could earn at a given interest rate, time and principal. | 1.11.1 | Using a 360-day compound interest table, compute the interest of $387 for 174 days at 5% interest.<br>a) $9.68 b) $ 9.47<br>c) $1.00 d) $19.35 |
| | | 1.11.2 | Sally Franks' passbook savings earns 7% interest compounded quarterly. Find the earned interest on $725 for 3 years. |
| 1.12 | Understand the use of a safe-deposit box. | 1.12.1 | Which item below would likely be kept in a safe-deposit box:<br>a) Valuable jewelry<br>b) Insurance policies<br>c) Irreplaceable family photographs<br>d) All of the above |
| | | 1.12.2 | List five items that would likely be kept in a safe-deposit box. |

COMPETENCY GOAL 1: The learner will solve problems related to how banks serve consumers.

| Objectives | Measures |
|---|---|
| 1.13 Determine the cost of obtaining a bank loan when given the principal, rate, and time. | 1.13.1 Keith Broadman signs a promissory note for $75 and 14.5% interest due in 90 days. Find the cost of the loan if the bank uses a 360-day year.<br>a) $31.72 b) $126.88<br>c) $12.69 d) $ 2.72 |
| | 1.13.2 Find the interest on a $200 loan taken out for one year at an annual rate of 17.6%. |

# MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Consumer Mathematics

COMPETENCY GOAL 2: The learner will solve problems related to consumer credit.

| Objectives | Measures |
|---|---|
| **2.1 Describe the types of credit plans available to the consumer in need of a loan (ready reserve, budget payment plans, open account, revolving account, credit cards, installment credit, pawn shop, commercial loan, and life insurance).** | 2.1.1 Which of the following is not a credit plan available to consumers:<br>a) Budget payment plans<br>b) Credit Cards<br>c) Certificate of Deposit<br>d) Revolving account<br>2.1.2 Describe a credit card plan available to a consumer in need of a loan. |
| **2.2 Determine the costs of obtaining a $1,000 loan for one (1) year through each of the plans listed in 2.1.** | 2.2.1 Randy Hertz pays $102 per month payment for one year on a $1,000 loan he obtained through an installment buying plan. Find the cost of this loan.<br>a) $1,224 b) $ 24<br>c) $1,000 d) $224<br>2.2.2 Romona Fritz borrows $1,000 using her bank credit card. Ramona plans to repay the loan plus interest at the end of one month. Her credit card agreement states that she pays $1\frac{1}{2}$ % interest monthly on the unpaid balance. Find the amount of money she will repay. |

| Objectives | Measures |
|---|---|

2.3 Complete a credit application.

2.3.1 In completing an application for credit, which piece of information are you least likely to need?

a) Credit references

b) An account of current indebtedness

c) Personal monthly income

d) Medical history

2.3.2 Fill out a credit application using your name and personal information and the following additional information. Assume that you do not have a co-borrower):

Purpose: to buy a used car
Cost: $2,800
Down payment: $300
Loan amount: $2,500
Credit references: Joe's Used Furniture, Quality Auto Parts
Monthly Income: $550
Job title: Sales clerk
Place of work: X-Mart
Savings: $500
Rent: $200

2.4 Use a calculator, if needed, to determine the penalty assessed for making a late payment on a loan.

2.4.1 If Paul Farrar does not pay his furniture payment of $68.00 by the 5th of each month, a $1\frac{1}{2}$% late charge is added to his next month's payment. If he paid $68.60 on June 10th, find Paul's July payment.

a) $78.60 b) $69.02

c) $68.42 d) $78.89

2.4.2 Alex Dexter has a car payment of $145.00 due by the first of each month. If Alex does not make the payment by the 10th of each month, a 2% late charge is added to his payment. Alex made his November payment on November 15th. Find the late charge for November.

COMPETENCY GOAL 2: The learner will solve problems related to consumer credit.

| Objectives | Measures |
|---|---|
| 2.5 Use a calculator to determine the cost of credit insurance. | 2.5.1 At the First National Bank, credit insurance is available on loans they issue at a rate of 12¢ per $100. In figuring the cost of insurance any portion of $100 also costs 12¢. Figure the cost of credit insurance on a loan of $12,623.63.<br>a) $15.15 b) $151.48<br>c) $15.24 d) $ 14.40 |
| | 2.5.2 The Easy Money Finance Company requires Credit Life Insurance on each loan they issue. Find the cost of credit insurance on a loan of $4,372 if the insurance costs 0.15% of the loan amount. |
| 2.6 List some of the features of the credit contract, in particular those included as the result of the Truth-in-Lending Act. | 2.6.1 Identify from the list below the features of a credit contract that must be included as a result of the Truth-in-Lending Act.<br>a) Annual percentage rate<br>b) Name of the lender<br>c) Credit limit<br>d) Personal annual income |
| | 2.6.2 List five features of the credit contract. Identify two of the five as features included as a result of the Truth-in-Lending Act. |
| 2.7 List the factors that affect a person's credit rating or help determine a person's credit limit. | 2.7.1 Identify the factor below that would affect a person's credit rating.<br>a) Personal income<br>b) Previous credit history<br>c) Outstanding debts<br>d) All of the above |
| | 2.7.2 List three factors that help determine a person's credit limit on a credit card account. |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Consumer Mathematics

COMPETENCY GOAL 3: The learner will solve problems related to housing.

| Objectives | Measures |
|---|---|
| 3.1 List advantages and disadvantages of buying a home. | 3.1.1 Identify the statement below that describes an advantage of owning a home:<br>a) Paying real estate taxes<br>b) Building equity<br>c) Increased maintenance cost<br>d) Ease of relocation<br>3.1.2 List three disavantages of owning a home. |
| 3.2 Determine the amount needed for a down payment when the rate (expressed as a percent) and amount of the purchase are given. | 3.2.1 John Snow would like to buy a new home that sells for \$63,800. John must make a 7.5% down payment in order to buy the house. Find John's down payment.<br>a) \$ 4,785 b) \$4,466<br>c) \$47,850 d) \$47.85<br>3.2.2 The Good Luck Savings and Loan Company requires 10% down on home mortgage loans. Find the down payment on a home that sells for \$82,500. |
| 3.3 Use a mortgage loan schedule or a computer program to determine the monthly cost for repaying a loan when given the number of years for which the loan is obtained and the mortgage amount. | 3.3.1 Using a mortgage loan schedule, find the monthly payment on \$76,000 for a period of 20 years at 9.5% interest.<br>3.3.2 Use a mortgage loan schedule or a computer program to determine the monthly payment on a loan of \$65,000 for a period of 30 years at $13\frac{1}{4}$ % interest. |

COMPETENCY GOAL 3: The learner will solve problems related to housing.

| Objectives | Measures |
|---|---|
| 3.4 Find the total cost of purchasing a home by adding the amount of interest, purchase price, closing costs and other fees. | 3.4.1 Find the total cost of purchasing an $85,000 house given the following cost amounts:<br>Interest: $156,782<br>Discount Points: $1,700<br>Title Search: $150<br>Record Deed: $30<br>a) $158,662 b) $243,662<br>c) $241,962 d) $241,782 |
| | 3.4.2 Joan and Ted have agreed to buy a house at a purchase price of $54,000. If they repay the loan over a period of twenty years at 11.8% interest, they will pay $87,136.37 interest. In addition, at closing, they must pay $850 in closing costs. Find the total cost of their home. |
| 3.5 Determine how much of the monthly mortgage payment is used to reduce the balance of the debt and how much is used to pay the interest. | 3.5.1 Sharon Spear has been paying on her home's 20-year mortgage for seven years. At present, approximately 78% of her payment goes to pay interest on the unpaid balance. Find how much of her $496 house payment is being applied to the balance of the debt.<br>a) $ 38.69 b) $109.12<br>c) $386.88 d) $476.16 |
| | 3.5.2 Fred Lassiter made his first payment of $465.62 on his new house; 98.3% of this payment went to pay off interest. How much, to the nearest cent, of his first payment was interest and how much was applied to the principal? |

| Objectives | Measures |
|---|---|

3.6 Find the property tax on a home when given the assessed value and tax rate.

3.6.1 What tax must Sam Levi pay on his home which is valued at $62,850 if the tax rate is $2.635 per $100? (In figuring the tax, any portion of $100 also costs $2.635).

a) $1,257.00  b) $165.61

c) $1,657.42  d) $263.50

3.6.2 The tax rate in Feedom County is 52.6 mills per dollar of assessed valuation. Find the tax to be paid on property assessed at $93,000.

3.7 Compute the insurance premium on a house when given a rate table or computer program and the amount of the mortgage.

3.7.1 Use the table below to find the annual premium on a homeowners' policy with a face value of $70,000. The homeowner would like a $100 deductible HO-2 policy and falls in Premium Group 2.

a) $487  b) $397  c) $462  d) $419

**NORTH CAROLINA ASSOCIATION OF INSURANCE AGENTS**

**PREMIUM GROUPS 1,2—HOMEOWNERS**

3.7.1

| AMOUNT COV. A | PREMIUM GROUP 1 | | | | | | | PREMIUM GROUP 2 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HO-1 | | HO-2 | | HO-3 | | HO-4 | HO-1 | | HO-2 | | HO-3 | | HO-4 |
| | Deductibles | | Deductibles | | Deductibles | | | Deductibles | | Deductibles | | Deductibles | | |
| | $100 | $50 | $100 | $50 | $100 | $50 | | $100 | $50 | $100 | $50 | $100 | $50 | |
| 35,000 | 152 | 164 | 169 | 182 | 178 | 192 | 221 | 176 | 190 | 197 | 213 | 206 | 222 | 268 |
| 36,000 | 157 | 170 | 175 | 189 | 184 | 199 | 229 | 182 | 197 | 203 | 219 | 213 | 230 | 277 |
| 37,000 | 162 | 175 | 181 | 195 | 191 | 206 | 237 | 188 | 203 | 210 | 227 | 220 | 238 | 287 |
| 38,000 | 168 | 181 | 187 | 202 | 197 | 213 | 255 | 194 | 210 | 217 | 234 | 227 | 245 | 296 |
| 39,000 | 173 | 187 | 193 | 208 | 203 | 219 | 263 | 200 | 216 | 224 | 242 | 234 | 253 | 305 |
| 40,000 | 178 | 192 | 198 | 214 | 209 | 226 | 271 | 207 | 224 | 231 | 249 | 242 | 261 | 315 |
| 41,000 | 183 | 198 | 204 | 220 | 215 | 232 | 279 | 213 | 230 | 238 | 257 | 249 | 269 | 324 |
| 42,000 | 189 | 204 | 210 | 227 | 222 | 240 | 287 | 219 | 237 | 245 | 265 | 256 | 276 | 333 |
| 43,000 | 194 | 210 | 216 | 233 | 228 | 246 | 295 | 225 | 243 | 251 | 271 | 263 | 284 | 343 |
| 44,000 | 199 | 215 | 222 | 240 | 234 | 253 | 304 | 231 | 249 | 258 | 279 | 270 | 292 | 352 |
| 45,000 | 205 | 221 | 228 | 246 | 240 | 259 | 312 | 237 | 256 | 265 | 286 | 277 | 299 | 361 |
| 46,000 | 210 | 227 | 234 | 253 | 246 | 266 | 320 | 243 | 262 | 272 | 294 | 285 | 308 | 370 |
| 47,000 | 215 | 232 | 240 | 259 | 252 | 273 | 328 | 249 | 269 | 279 | 301 | 292 | 315 | 380 |
| 48,000 | 220 | 238 | 245 | 265 | 259 | 280 | 336 | 256 | 276 | 286 | 309 | 299 | 323 | 389 |
| 49,000 | 226 | 244 | 251 | 271 | 265 | 286 | 344 | 262 | 283 | 292 | 315 | 306 | 330 | 398 |
| 50,000 | 231 | 249 | 257 | 278 | 271 | 293 | 352 | 268 | 289 | 299 | 323 | 313 | 338 | 408 |
| 55,000 | 257 | 278 | 287 | 310 | 302 | 326 | 392 | 298 | 322 | 333 | 358 | 349 | 374 | 454 |
| 60,000 | 290 | 313 | 322 | 348 | 341 | 366 | 442 | 337 | 362 | 376 | 401 | 394 | 419 | 513 |
| 65,000 | 322 | 348 | 360 | 385 | 380 | 405 | 492 | 375 | 400 | 419 | 444 | 439 | 464 | 571 |
| 70,000 | 356 | 381 | 397 | 422 | 419 | 444 | 543 | 413 | 438 | 462 | 487 | 483 | 508 | 629 |
| 75,000 | 389 | 414 | 434 | 459 | 457 | 482 | 593 | 451 | 476 | 504 | 529 | 528 | 553 | 687 |
| 80,000 | 417 | 442 | 465 | 490 | 490 | 515 | 635 | 483 | 508 | 540 | 565 | 566 | 591 | 736 |
| 85,000 | 445 | 470 | 496 | 521 | 523 | 548 | 677 | 515 | 540 | 576 | 601 | 604 | 629 | 785 |
| 90,000 | 473 | 498 | 527 | 552 | 556 | 581 | 719 | 547 | 572 | 612 | 637 | 642 | 667 | 834 |
| 95,000 | 501 | 526 | 558 | 583 | 589 | 614 | 761 | 579 | 604 | 648 | 673 | 680 | 705 | 883 |
| 100,000 | 529 | 554 | 589 | 614 | 622 | 647 | 803 | 611 | 636 | 684 | 709 | 718 | 743 | 932 |
| Ea. add'l. $1,000 | 5.60 | — | 6.20 | — | 6.60 | — | 8.40 | 6.40 | — | 7.20 | — | 7.60 | — | 9.80 |

3.7.2 Use a rate table or computer program to determine the annual premium for a homeowners' insurance policy with a face value of $65,000 and an annual rate of $.36 per $100.

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COMPETENCY GOAL 3: The learner will solve problems related to housing.

| Objectives | Measures |
|---|---|
| 3.8 Compute the yearly amount of rent to be paid when given the monthly amount. | 3.8.1 Molly Atkinson pays $540 rent per month on her three-bedroom home. How much rent does she pay per year?<br>a) $5,400 b) $ 6,480<br>c) $1,620 d) $19,440 |
| | 3.8.2 Hank Hutchins pay $368 rent per month. How much rent does he pay per year? |
| 3.9 Find the total utility bill when given the charges for electricity, telephone and other items. Use a calculator if necessary. | 3.9.1 Determine the total utility bill for a month in which the individual costs were:<br>Electricity: $78.63<br>Water: $19.41<br>Gas: $25.61<br>Telephone: $31.62<br>a) $ 78.63 b) $123.65<br>c) $129.66 d) $155.27 |
| | 3.9.2 Find Alma Suthers' total utility bill for the month of December given the individual items below:<br>Electricity: $85.32<br>Gas: $55.87<br>Telephone: $26.43 |
| 3.10 List the advantages and disadvantages of renting a house, apartment, and mobile home. | 3.10.1 Identify the item below that describes a disadvantage of renting a house:<br>a) No maintenance cost.<br>b) No equity build-up.<br>c) Ease of relocation.<br>d) No long-term commitment. |
| | 3.10.2 List four advantages of renting a house instead of buying. |

COMPETENCY GOAL 3: The learner will solve problems related to housing.

| Objectives | Measures |
|---|---|
| 3.11 Find the cost of furnishing a home when given the cost of the individual items to be included in the home. Use a calculator if necessary. | 3.11.1 Beth Moseley would like to completely refurnish her three-bedroom home. She has selected the items she would like to purchase and has compiled the following list. Find the total cost of refurnishing her home. |

| | |
|---|---|
| Master bedroom: | $2,162.34 |
| Second bedroom: | $1,262.84 |
| Third bedroom: | $ 864.32 |
| Living room: | $2,372.06 |
| Dining room: | $1,863.46 |
| Windows: | $1,062.89 |

a) $ 9,587.91

b) $9,587.61

c) $95,879.10

d) $ 958.79

3.11.2 Sid Randolph has recently purchased a small two-bedroom house. He has analyzed his furnishing needs and has compiled the following list of items. Find the total cost of furnishing his house.

| | |
|---|---|
| Master bedroom: | $1,495.00 |
| Second bedroom: | $1,086.41 |
| Living room: | $1,682.00 |
| Color TV: | $ 862.81 |
| Dining set: | $ 745.61 |
| Draperies: | $ 892.63 |
| Miscellaneous: | $ 400.00 |

| Objectives | Measures |
|---|---|
| 3.12 Use a computer to investigate home mortgage amortization. | 3.12.1 Which piece of information below would not need to be typed into a computer in order to do a loan amortization schedule? |

a) Total interest over loan period.

b) Interest rate.

c) Principal.

d) Loan period.

3.12.2 Use a computer program to print an amortization schedule for a home mortgage of $86,962 at 12.7% for 30 years.

# MATHEMATICS

**Grade Level:** 10-12 **Skills/Subject Area:** Consumer Mathematics

**COMPETENCY GOAL 4:** The learner will solve problems related to insurance.

| Objectives | Measures |
|---|---|
| 4.1 Distinguish between term life insurance and universal whole life insurance. | 4.1.1 Identify the characteristic below that does not apply to term life insurance.<br>a) Premiums are low.<br>b) Coverage is for a stated period of time only.<br>c) Premiums are paid as long as you live.<br>d) Often sold as credit insurance. |
| | 4.1.2 Discuss the major difference between term life and universal whole life insurance. |
| 4.2 Use a premium rate table or computer program to find the annual premium of various types of insurance. | 4.2.1 Stan Jessup is 17 and has just purchased a four-cylinder car with few options. He has a good driving record with no moving violations. He would like to purchase a $100 deductible collision insurance policy. Use a rate table to determine his annual premium. |
| | 4.2.2 Use a premium rate table or a computer program to find the annual premium for a five-year term life insurance policy issued to a female, age 35. |
| 4.3 Find the monthly premium on various types of insurance when given a premium rate table or computer program, the types, and amount of insurance. | 4.3.1 Bill Hollingsworth decides that he needs $40,000 worth of life insurance to protect his family. Bill is 20 years old and has chosen a 10-year term policy. Use a rate table to find his monthly premium. |
| | 4.3.2 Find the monthly premium of a $50,000 whole life insurance policy issued to a male at age 35. |

COMPETENCY GOAL 4: The learner will solve problems related to insurance.

| Objectives | Measures |
|---|---|
| 4.4 Determine annual and periodic premium payments when given the amount of insurance and a periodic payment schedule. | 4.4.1 Using a Short-Rate Cancellation Table, find the returned premium for 152 days on an insurance policy with an annual premium of $684.32. |
| | 4.4.2 Joy Hill would like to purchase a $100/300/100 liability insurance policy. Joy is 25 years old, has a good driving record and drives less than 10 miles to work. Use a rate table to find her semi-annual premium. |
| 4.5 Use a premium rate table or fixed percentage rate to find the annual premium on a disability insurance policy. | 4.5.1 Owen Gladstone is an executive secretary and earns $300 per week. His company offers a disability plan that may be paid by payroll deductions. The disability insurance rate is 1.2% of the first $17,500. Find Owen's annual premium.<br>a) $210.00 b) $187.20<br>c) $360.00 d) $206.40 |
| | 4.5.2 Samantha Evans is a 45 year old construction worker and would like to protect herself and her family by purchasing a disability insurance plan. Her annual salary is $28,000. Use a rate table to find her annual premium. |
| 4.6 Determine the costs of various hospitalization insurance plans when given premium rate tables and the other needed information. | 4.6.1 Leroy McCellan (age 34) and his wife Regan (age 32) plan to insure themselves and their two children under a Hospital Insurance Plan. They have selected an $80 per day daily hospital benefit with a $250 deductible clause. Use a rate table to determine their annual premium. |
| | 4.6.2 Use a premium rate table to find the annual premium for a $100 per day hospital-surgical policy issued to a single male at age 29. |

COMPETENCY GOAL 4: The learner will solve problems related to insurance.

| Objectives | Measures |
|---|---|
| 4.7 Describe the types of available property insurance and compute the costs of these (e.g., fire, casualty, theft, and extended coverage). | 4.7.1 What will Ervin Alsnore have to pay for fire insurance per year to insure his store building valued at $152,000 for four-fifths the value at the rate of 24¢ per $100.<br>a) $291.34 b) $ 364.80<br>c) $364.80 d) $1,216.00 |
| | 4.7.2 Describe the protection you could expect from a fire insurance policy on your home. |
| 4.8 Read and analyze an insurance policy. | 4.8.1 Using an insurance policy declaration sheet, determine the type of policy and the period over which the coverage is extended. |
| | 4.8.2 Using an insurance policy declaration sheet, find the limit of liability for bodily injury per accident. |

**Grade Level:** 10-12 **Skills/Subject Area:** Consumer Mathematics

**COMPETENCY GOAL 5:** The learner will investigate the elementary concepts of probability and statistics that affect the typical consumer.

| Objectives | Measures |
|---|---|
| **5.1 Make predictions based on the theory of probability.** | 5.1.1 Assume that you toss a fair coin. Identify which situation below is more likely to occur:<br>a) Toss twice, get 1 head and 1 tail.<br>b) Toss 100 times, get 50 heads.<br>c) Toss 100 times, get 90 heads.<br>d) Toss 100 times, get 40 to 60 heads. |
| | 5.1.2 Find the mathematical probability of drawing a two from an ordinary deck of 52 playing cards. |
| **5.2 Interpret a bar graph, circle graph, line graph, and a pictograph.** | 5.2.1 Select a line graph from a newspaper or magazine. Interpret its contents for other members of the class. |
| | 5.2.2 Select a circle graph from a newspaper or magazine. Interpret its contents for other members of the class. |
| **5.3 Find the mean, median, and mode of a set of data. Use a calculator if needed.** | 5.3.1 Construction workers at ten companies receive the following hourly wages (in dollars). Find the median wage.<br>6.97, 8.59, 8.48, 5.65, 9.08, 6.65, 7.81, 8.02, 4.70, 6.55<br>a) 7.25 b) 7.39 c) 6.97 d) 7.81 |
| | 5.3.2 The following data represents the weekly price per pound of frying chicken (in cents) over a 36-week period at the Nifty Food Store:<br>72, 72, 68, 72, 72, 68, 68, 66, 68, 66, 60, 58, 58, 58, 60, 66, 62, 60, 64, 66, 68, 68, 70, 72, 74, 76, 74, 76, 72, 72, 70, 68, 68, 70, 72, 68.<br>Find the mean, median, and mode for the data. |

COMPETENCY GOAL 5: The learner will investigate the elementary concepts of probability and statistics that affect the typical consumer.

| Objectives | Measures |
|---|---|

5.4 Find the range for the entries in a set of data.

5.4.1 Give the range for the set of numbers below:

23,22,22,21,16,14,8

a) 15 b) 18 c) 22 d) 21

5.4.2 The data below represents the normal precipitation (in inches) expected for Charlotte, NC, by months. Find the range of the set of data.

| | | | |
|---|---|---|---|
| Jan. | 3.51 | July | 4.57 |
| Feb. | 3.83 | Aug. | 3.96 |
| Mar. | 4.52 | Sept. | 3.46 |
| Apr. | 3.40 | Oct. | 2.69 |
| May | 2.90 | Nov. | 2.74 |
| June | 3.70 | Dec. | 3.44 |

5.5 Determine if a sample is biased or reliable.

5.5.1 You have been given the task of testing the mathematical ability of fifth grade students in a particular state. Your directive is to select a reliable sample of 60,000 students and test those students. Suppose it has been determined that 0.6 of the children live in urban centers, 0.25 in the suburbs, and 0.15 in rural districts. Which sampling procedures would likely produce the most reliable sample?

a) Take a random sample of 20,000 children in each category.

b) Take a random sample of schools, including enough classes so that there will be 60,000 children in the sample.

c) Take a random sample of 56,000 urban children, 15,000 suburban, and 9,000 rural.

d) Take a random sample of 36,000 urban children, 15,000 suburban, and 9,000 rural.

5.5.2 A random sample of 2,000 students has been selected from the population of Nomore University. According to enrollment information, 10% of the total student population are graduate students. An analysis of the sample shows that 1,125 of the students selected are graduate students. Is the sample biased or reliable?

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Consumer Mathematics

COMPETENCY GOAL 6: The learner will solve problems related to money management concerns which are faced by the typical consumer.

| Objectives | Measures |
|---|---|

6.1 Find the weekly income for a wage earner who receives piece-work wages.

6.1.1 Aretha Ford makes artificial flowers for a nearby florist. She is paid 46¢ for a daisy, 63¢ for a carnation, and 75¢ for a rose. Last month she sold 300 daisies, 550 carnations, and 325 roses. Find her earnings last month.

a) $1,282.50 b) $1,171.00

c) $1,175.00 d) $ 728.25

6.1.2 Ward Hall works in a garment factory and received 52¢ for each item completed. Using the record of his work below find his salary for the week of March 2.

| | | | |
|---|---|---|---|
| Monday | - | 161 | Items completed |
| Tuesday | - | 120 | " " |
| Wednesday | - | 152 | " " |
| Thursday | - | 190 | " " |
| Friday | - | 133 | " " |

6.2 Compute the weekly income for a wage earner who is paid an hourly wage and extra pay for overtime.

6.2.1 Amanda Gentry works in a steel mill and is paid $9.00 per hour regular time and $18.00 per hour for holiday and weekend work. Find her earnings for a week in which she works an eight hour shift on Sunday in addition to her regular 40 hour week.

a) $396 b) $504 c) $330 d) $864

6.2.2 Guy Effrics earns $10.50 per hour for regular time and time-and-a-half for overtime work. Last week, Guy worked 6 hours over his weekly 40-hour job. Find his salary for last week.

6.3 Determine the monthly income for a wage earner who is paid a commission.

6.3.1 Maud Prince works on a commission of $7\frac{1}{2}$ % on all sales during a calendar month. During the month of August, Maud sold $16,892 worth of goods. Find her earnings for August.

a) $ 844.60 b) $1,182.44

c) $1,266.90 d) $1,351.36

6.3.2 Last month Bill Seldon sold $255,000 worth of real-estate. If he earns 2% commission on his sales, determine his earnings for last month.

**COMPETENCY GOAL 6:** The learner will solve problems related to money management concerns which are faced by the typical consumer.

| Objectives | Measures |
|---|---|
| 6.4 Use a Social Security Withholding Table to determine deductions. | 6.4.1 Fred Moore earns $441.25 per week. Use a standard Social Security Withholding Table to determine his social security deduction.<br>a) $29.70 b) $29.63<br>c) $29.55 d) None of the above |
| | 6.4.2 Use a Social Security Withholding Table to determine the deduction appropriate for a wage earner with a salary of $1,685 per week. |
| 6.5 Compare the cost of two items by finding the unit price of each. | 6.5.1 A 10 oz. bottle Hot Stuff Barbecue Sauce sells for $1.45. An 8 oz. bottle of Sizzle Barbecue Sauce sells for $1.32. Use the unit price of each item to determine which is the better buy.<br>a) Hot Stuff, 14.5¢ per oz.; Sizzle, 12.8¢ per oz.; Sizzle is better buy.<br>b) Hot Stuff, 1.45¢ per oz.; Sizzle, 16¢ per oz.; Hot Stuff is better buy.<br>c) Hot Stuff, 14.5¢ per oz.; Sizzle, 16¢ per oz.; Sizzle is better buy.<br>d) Hot Stuff, 14.5¢ per oz.; Sizzle, 16.5¢ per oz.; Hot Stuff is better buy. |
| | 6.5.2 A 6 oz. box of Spaceshot Cereal sells for 78¢ while the economy-size 15 oz. box sells for $1.98. Which size is the better buy? |
| 6.6 Determine the amount of change that should be returned when given the cost of a purchase and the amount of money given the clerk. | 6.6.1 Max Mooney purchased $73.26 worth of goods while Christmas shopping at X-Mart. He gave the clerk a $100 bill to pay for the items. How much change should Max receive?<br>a) $26.74 b) $27.74<br>c) $26.76 d) $73.26 |
| | 6.6.2 Alfonzo Rich gives the clerk at the record store a $20 bill to pay for two records at a total price, including tax, of $13.63. Determine the amount of change Alfonzo should receive from the clerk and the most likely combination of bills and coins the clerk would use. |

**COMPETENCY GOAL 6:** The learner will solve problems related to money management concerns which are faced by the typical consumer.

| Objectives | Measures |
|---|---|
| 6.7 Compute the discount on a purchase. | 6.7.1 Sandy Hayes find an ad for a used car in her local newspaper which states the regular price as $1,995 and the special sales price as $1,596. What was the discount on the regular price?<br>a) 20% b) $352<br>c) 17% d) $339 |
|  | 6.7.2 Lee Smythe is shopping for a new suit on a fall clearance sale at a department store. One selection of suits is selling at 15% off the regular price. Find the sale price of a suit that regularly sells for $149.95. |
| 6.8 Determine how much extra is paid to purchase an article on an installment plan instead of purchasing it with cash. Use a calculator if needed. | 6.8.1 Betty Daughtry is financing a new car with her company credit union. The purchase price of the car is $7,136.86. The credit union offers financing over a period of 4 years for a new car. If her payment is $196.32 per month for 48 months how much more is she paying on the installment plan than the original purchase price?<br>a) $3,769.34 b) $715.94<br>c) $2,286.50 d) $148.68 |
|  | 6.8.2 Franklin Zeffer is buying new bedroom furniture at the purchase price of $1,632.19. The Woodlow Furniture Co. offers an easy plan whereby they will finance furniture for a period of one year and require no down payment. Franklin's monthly payment will be $161.86 if he finances his furniture. How much more will he pay on the easy payment plan than the actual purchase price? |

**COMPETENCY GOAL 6:** The learner will solve problems related to money management concerns which are faced by the typical consumer.

| Objectives | Measures |
|---|---|
| 6.9 Compute net income when given the income and deductions. | 6.9.1 Suppose you work for the Yummy Ice Cream Store as a clerk. Your weekly salary is $152. Using the list of deductions below, determine the net pay for the week.<br>Federal Tax: $23.00<br>State Tax: $12.00<br>Social Security: $15.86<br>a) $113.14 b) $101.14<br>c) $ 50.86 d) $135.79 |
| | 6.9.2 Alvin Hinkle earns $462 per week. From this is deducted federal tax in the amount of $74.32, social security in the amount of $31.85, and state tax in the amount of $26.82. Find Alvin's net income for a week. |
| 6.10 Convert weekly expenditures to yearly and/or monthly amounts. | 6.10.1 Rusty Hoffman usually spends $14 per week on gasoline. Find his usual monthly expenditures for gasoline. Use $4\frac{1}{3}$ weeks as an average month.<br>a) $728.00 b) $56.00<br>c) $ 60.67 d) $70.00 |
| | 6.10.2 If you find on the average you spend $65 a week for groceries, compute the amount you would expect to spend over the period of a year. |

**COMPETENCY GOAL 6:** The learner will solve problems related to money management concerns which are faced by the typical consumer.

| Objectives | Measures |
|---|---|

**6.11** Compute average expenditures. Use a calculator as needed.

6.11.1 Alexa Simmons is a traveling salesperson for the Worldbright Encyclopedia Co. She is instructed by her company to keep a record of her mileage each month. Last year her travel was as described below. Find to the nearest mile the average mileage Alexa traveled per month.

| | | | |
|---|---|---|---|
| January | 1862 | July | 2681 |
| February | 2091 | August | 2482 |
| March | 2562 | September | 1651 |
| April | 1231 | October | 1375 |
| May | 1962 | November | 2275 |
| June | 2105 | December | 2502 |

a) 2065 b) 476.5 c) 477 d) 2064.9

6.11.2 Last week, Steve Frink spent the following amounts for lunches:

Monday - $3.45
Tuesday - $5.62
Wednesday - $2.97
Thursday - $3.63
Friday - $8.98

Find Steve's average expenditure for lunch last week.

**6.12** Estimate the cost of a list of items common to the consumer.

6.12.1 Indicate the best estimate for the list of items purchased from a moderately priced clothing store.

3 pairs men's dress slacks @ $15.99
2 campus shirts for men @ $8.49
2 men's belts @ $7.50
2 Jordache ladies' sweaters @ $14.99
1 pair ladies' slacks @ $24.49

a) $300 b) $150 c) $50 d) $500

6.12.2 Given a list of grocery items and a newspaper ad, make an estimate of the total cost.

MATHEMATICS

**Grade Level:** 10-12 Skills/Subject Area: Consumer Mathematics

**COMPETENCY GOAL 7:** The learner will solve problems related to savings and investments.

| Objectives | | Measures | |
|---|---|---|---|
| 7.1 | **Compare compound and simple interest returns on investments.** | 7.1.1 | Jake Joyner has $1,000 to invest. He plans to invest the $1,000 for a period of at least 10 years. How much more could he earn investing the money at 8% compounded annually rather than at 8% simple interest?<br>a) $1,078.93 b) $396.41<br>c) $ 215.89 d) $358.30 |
| | | 7.1.2 | Determine how much more interest could be earned on $1,000 invested for a period of five years at 8% interest compounded annually than the same investment made for a period of 5 years at 8% simple interest. |
| 7.2 | **Find the difference between the amount of earnings that could be earned when money is invested at a savings and loan association, bank, credit union, and U.S. Savings Bond. Use a calculator or computer program if needed.** | 7.2.1 | Suppose your company credit union pays $7\frac{1}{2}$ % compounded quarterly on a regular savings plan. A $1,000 U.S. Treasury Bond costs $500 and matures after approximately 7 years. Find the difference in earnings between the two savings plans on a $500 investment after a period of 7 years.<br>a) $37.50 b) $173.20<br>c) $75.00 d) $262.50 |
| | | 7.2.2 | A $50 U.S. Savings Bond costs $25 and matures after approximately 7 years. Assuming you can receive $5\frac{1}{4}$ % interest compounded quarterly on a regular savings account, find the difference in the earnings after seven years. |

COMPETENCY GOAL 7: The learner will solve problems related to savings and investments.

| Objectives | Measures |
|---|---|
| 7.3 Compare the difference in return between money which is invested in a regular savings account and a certificate of deposit. Use a calculator or computer as needed. | 7.3.1 The Algood Bank and Trust Company offers passbook savings at 6% compounded semi-annually At the same bank, 30-month certificates of deposit are paying 11.562% interest compounded quarterly. Determine the difference in earnings on a $2,000 investment over a 30-month period for the two savings plans.<br>a) $120.00 b) $111.24<br>c) $340.84 d) $360.00 |
| | 7.3.2 Ferdinand Alexander found after checking with his banker that regular savings pays $5\frac{3}{4}$% compounded quarterly. At the present time, six-month certificates of deposit are paying 10.035% interest compounded quarterly. Compute the difference in earnings on a $700 investment for the two savings plans over a period of 6 months. |
| 7.4 Find the anticipated return on an investment when given the amount, time, and projected rate of earnings. | 7.4.1 Rita Almand makes a $75,000 investment in a small company. After analyzing the market she expects a 9% return on her investment the first year. Find her projected earnings.<br>a) $337.50 b) $3,375.00<br>c) $675.00 d) $6,750.00 |
| | 7.4.2 A. J. Brent purchases a duplex apartment building for investment. His initial investment is $114,000. Figuring rent and and appreciation he anticipates a 14% return on his investment for the first year. Find the amount of his earnings for the first year. |

Skills/Subject Area: Consumer Mathematics

COMPETENCY GOAL 7: The learner will solve problems related to savings and investments.

| | Objectives | | Measures |
|---|---|---|---|
| 7.5 | Determine the cost of buying shares of stock. | 7.5.1 | Sue Appleberry purchases Depont stock at the "Low" of the day. If the "Low" is 144 $\frac{1}{2}$, find the cost of 100 shares.<br>a) $ 144.50 b) $ 14,450.00<br>b) $1,445.00 d) $144,500.00 |
| | | 7.5.2 | On a particular day, the "Low" for stock in the Ferro Corporation was 23 $\frac{1}{4}$ while the "High" was 23 $\frac{3}{4}$. Find the cost of 100 shares of stock if bought at the "Low". |
| 7.6 | Compare the difference in the cost of a stock if bought at the "Low" of the day and the "High" of the day. | 7.6.1 | Seth Bartlow buys 75 shares of American Medical stock at the "High" of the day. How much could he have saved by buying at the "Low" of the day if the "High" was 30 $\frac{3}{4}$ and the "Low" was 27 $\frac{1}{4}$?<br>a) $262.50 b) $204.38<br>c) $230.63 d) $225.00 |
| | | 7.6.2 | The "Low" for Fedders Stock on a particular day was 43 $\frac{1}{2}$ and the "High" was 44 $\frac{7}{8}$. How much would you save if you bought 50 shares of Fedders at the "Low" of the day rather than the "High" of the day? |
| 7.7 | Determine the annual dividend received on common stock when given the dividend rate and the number of shares. Use a calculator as needed. | 7.7.1 | Find the annual dividend on 330 shares of common stock with an annual dividend rate of 4 $\frac{3}{4}$ % if the stock sells for $75.25 per share.<br>a) $1,567.50 b) $1,179.54<br>c) $ 15.68 d) $ 357.44 |
| | | 7.7.2 | The annual dividend rate on Union Oil common stock is 3.2%. Find the annual dividend on on 60 shares of stock that sells for $52 per share. |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Consumer Mathematics

COMPETENCY GOAL 8: The learner will solve problems related to sales tax and income tax.

| Objectives | Measures |
|---|---|

8.1 Use a table to find the sales tax on a purchase.

8.1.1 Frankie Mason is a clerk in a sporting goods store. Use a sales tax chart to determine the sales tax she would charge a customer on a purchase of \$93.68 at a rate of $4 \frac{1}{2}$ %.

a) \$3.64 b) \$4.21 c) \$4.22 d) \$ .42

NORTH CAROLINA DEPARTMENT OF REVENUE
4½ % COMBINED STATE AND LOCAL SALES & USE TAX CHART

| SALES | TAX | SALES | TAX | SALES | TAX | SALES | TAX |
|---|---|---|---|---|---|---|---|
| 52.78-52.99 | 2.38 | 65.67-65.88 | 2.96 | 78.56-78.77 | 3.54 | 91.45- 91.66 | 4.12 |
| 53.00-53.22 | 2.39 | 65.89-66.11 | 2.97 | 78.78-78.99 | 3.55 | 91.67- 91.88 | 4.13 |
| 53.23-53.44 | 2.40 | 66.12-66.33 | 2.98 | 79.00-79.22 | 3.56 | 91.89- 92.11 | 4.14 |
| 53.45-53.66 | 2.41 | 66.34-66.55 | 2.99 | 79.23-79.44 | 3.57 | 92.12- 92.33 | 4.15 |
| 53.67-53.88 | 2.42 | 66.56-66.77 | 3.00 | 79.45-79.66 | 3.58 | 92.34- 92.55 | 4.16 |
| 53.89-54.11 | 2.43 | 66.78-66.99 | 3.01 | 79.67-79.88 | 3.59 | 92.56- 92.77 | 4.17 |
| 54.12-54.33 | 2.44 | 67.00-67.22 | 3.02 | 79.89-80.11 | 3.60 | 92.78- 92.99 | 4.18 |
| 54.34-54.55 | 2.45 | 67.23-67.44 | 3.03 | 80.12-80.33 | 3.61 | 93.00- 93.22 | 4.19 |
| 54.56-54.77 | 2.46 | 67.45-67.66 | 3.04 | 80.34-80.55 | 3.62 | 93.23- 93.44 | 4.20 |
| 54.78-54.99 | 2.47 | 67.67-67.88 | 3.05 | 80.56-80.77 | 3.63 | 93.45- 93.66 | 4.21 |
| 55.00-55.22 | 2.48 | 67.89-68.11 | 3.06 | 80.78-80.99 | 3.64 | 93.67- 93.88 | 4.22 |
| 55.23-55.44 | 2.49 | 68.12-68.33 | 3.07 | 81.00-81.22 | 3.65 | 93.89- 94.11 | 4.23 |
| 55.45-55.66 | 2.50 | 68.34-68.55 | 3.08 | 81.23-81.44 | 3.66 | 94.12- 94.33 | 4.24 |
| 55.67-55.88 | 2.51 | 68.56-68.77 | 3.09 | 81.45-81.66 | 3.67 | 94.34- 94.55 | 4.25 |
| 55.89-56.11 | 2.52 | 68.78-68.99 | 3.10 | 81.67-81.88 | 3.68 | 94.56- 94.77 | 4.26 |
| 56.12-56.33 | 2.53 | 69.00-69.22 | 3.11 | 81.89-82.11 | 3.69 | 94.78- 94.99 | 4.27 |
| 56.34-56.55 | 2.54 | 69.23-69.44 | 3.12 | 82.12-82.33 | 3.70 | 95.00- 95.22 | 4.28 |
| 56.56-56.77 | 2.55 | 69.45-69.66 | 3.13 | 82.34-82.55 | 3.71 | 95.23- 95.44 | 4.29 |

8.1.2 Use a $4 \frac{1}{2}$ % sales tax chart to determine the tax on a purchase of \$182.63.

8.2 Use a calculator to find the sales tax on a purchase without using a sales tax table.

8.2.1 Determine the sales tax on a \$78.00 purchase if the tax rate is $5 \frac{1}{2}$ %.

a) \$429.00 b) \$42.90

c) \$ 3.90 d) \$ 4.29

8.2.2 Becton Risname is considering buying a new stereo that costs \$545.95. How much sales tax should he expect to pay if the rate is $6 \frac{1}{2}$%?

**COMPETENCY GOAL 8:** The learner will solve problems related to sales tax and income tax.

| Objectives | | Measures | |
|---|---|---|---|
| 8.3 | Use a table to determine the amount of income tax which should be withheld from a given salary. | 8.3.1 | Ursula Edwards has a monthly salary of $890.62. Since she earns more money than her husband, she is eligible to claim the $2,200 exemption on the North Carolina Employee's Withholding exemption certificate. Use a standard North Carolina Withholding Table to determine the amount of state tax that should be withheld from her monthly paycheck.<br>a) $41.46 b) $30.25 c) $27.85 d) $5.22 |
| | | 8.3.2 | Use an Income Tax Withholding Table to determine how much federal income tax should be withheld from J. R. Cane's weekly salary of $432. J. R. claimed two dependent allowances on Form W-4 when he was hired for his job. |
| 8.4 | Complete some of the lines on the North Carolina and United States Income Tax Forms. | 8.4.1 | Which statement below best describes "adjusted gross income" as it applies to Federal Income Tax Form 1040:<br>a) Total earnings of an individual for one month.<br>b) Tax due and payable to the Internal Revenue Service.<br>c) Total refund due the tax payer.<br>d) Total income after all sources of income have been added. |
| | | 8.4.2 | Use a current North Carolina tax form and the following information to compute Hugh Frye's N.C. tax.<br>Name: Hugh Frye<br>Age: 37<br>Social Security #: 587-00-1406<br>Martial status: Single<br>Income: $16,864<br>Tax withheld: $325<br>Deductions: Not itemized<br>Occupation: Secretary<br>Address: 221 Market Avenue<br>Sometown, ST 05821 |

# MATHEMATICS

**Grade Level:** 10-12 **Skills/Subject Area:** Consumer Mathematics

**COMPETENCY GOAL 9:** The learner will solve problems related to the transportation needs of the consumer.

| Objectives | Measures |
|---|---|
| 9.1 Find the amount needed for the down payment on a car when given the cost of the car and the down payment rate. | 9.1.1 Wendi Fret plans to buy a new car priced at \$10,332. She will need 10% down in order to purchase the car. How much money will she need to get possession of the car?<br>a) \$1,033.20 b) \$ 103.32<br>c) \$ 10.33 d) \$10,332.00<br>9.1.2 Find Jeff Algood's down payment on a \$4,495 used car if he is required to pay 15% down. |
| 9.2 Use a monthly payment table or computer program to find how much more you pay for a car when bought on time than when bought with cash. | 9.2.1 William Wallace finances \$2,000 through the Reasonable Finance Company at a rate of 1% per month for a period of one year. Find William's monthly payment.<br>9.2.2 Alvin Schletter needs to finance \$6,200. If he pays 14.5% interest for 3 years, find how much the financing costs him. |
| 9.3 Use a table to find the basic cost for bodily injury and property damage insurance. | 9.3.1 Use a rate chart to determine the liability premium for a single male, age 21, with a poor driving record and a rating factor of 3.65. Assume this person wants a 50/100 bodily injury policy and a \$10,000 property damage policy.<br>9.3.2 Use a rate table to find the cost for insuring the car of a married male, age 45, with a 100/200/100 bodily injury and property damage insurance. Assume the car is used for business and the owner has a good driving record. |

COMPETENCY GOAL 9: The learner will solve problems related to the transportation needs of the consumer.

Objectives

Measures

9.4 Compare the costs of $50, $100, and $200 deductible collision insurance.

9.4.1 The Good State Insurance Company has determined they can sell $100 deductible collision insurance for 15% less that $50 deductible insurance. Find the cost of a $100 deductible policy if a comparable $50 deductible policy costs $261.

a) 307.05 b) $221.85

c) $482.85 d) $201.00

9.4.2 Use a rate table to determine the difference in cost of a $50 deductible collision policy and a $200 deductible collision policy for a single female with a small economy car.

9.5 Find the cost per mile for operating a car when given the cost of the fuel, oil, and estimated maintenance and depreciation.

9.5.1 Brent Gregory is anticipating driving a car 18,000 miles next year. Based on reasonable estimates, he has compiled the following lists of expenses:

| | |
|---|---|
| Depreciation | $1,280.00 |
| Insurance | $ 455.00 |
| License/Fees | $ 30.00 |
| Garage/Parking | $ 200.00 |
| Gasoline | $1,050.00 |
| Repairs | $ 325.00 |

Based on Brent's estimates, find his anticipated cost per mile to the nearest tenth of a cent.

a) 18.6¢ b) 18.5¢ c) 18.65¢ d) 15¢

9.5.2 Saul Esner keeps records on the cost of driving his car over a 6-month period. During that time he drove 6,832 miles and incurred the following expenses:

| | |
|---|---|
| Gasoline | $533.00 |
| Oil | $ 8.92 |
| Maintenance | $233.00 |
| Depreciation | $400.00 |

Find the cost per mile over the 6-month period.

**COMPETENCY GOAL 9:** The learner will solve problems related to the transportation needs of the consumer

| | Objectives | | Measures |
|---|---|---|---|
| 9.6 | Compute the fuel consumption for a trip when given the amount of fuel used and the distance driven. | 9.6.1 | Dave Owatana drove his car 863 miles last month and bought 34 gallons of gasoline. Find his car's average consumption rate in miles per gallon correct to the nearest tenth.<br>a) 25.3 b) 35.38 c) 25.4 d) 39.4 |
| | | 9.6.2 | Joan Albert drove 3,286 km on her vacation and used 520 liters of gasoline. Find her gas efficiency in kilometers per liter. |
| 9.7 | Use the distance formula to determine the average speed, time, or rate when given the other two entries. | 9.7.1 | Rita needs an estimate of the number of miles she drove on a business trip. She drove for six hours at an estimated average speed of 45 miles per hour. Find her estimated distance.<br>a) 720 b) 51 c) 270 d) 133 |
| | | 9.7.2 | Don drove 362 miles in nine hours. Find Don's average rate of speed for the trip. |
| 9.8 | Use a table and a calculator to determine the fee for renting a car. | 9.8.1 | Use the table below for the Kurtz Rent-a-Car Company to find Joe Jones' cost for renting a station wagon for a period of five days and a total of 1200 miles.<br>KURTZ RENT-A-CAR<br>Compact-- $20 per day plus 26¢ per mile<br>Intermediate-- $25 per day plus 30¢ per mile<br>Station Wagon-- $30 per day plus 32¢ per mile<br>a) $534 b) $520 c) $510 d) $414 |
| | | 9.8.2 | Use the table above to compute the fee for renting a compact car from the Kurtz Rent-a-Car Company for a 300-mile trip during a period of one day. |

COMPETENCY GOAL 9: The learner will solve problems related to the transportation needs of the consumer.

| Objectives | Measures |
|---|---|
| 9.9 Estimate the cost of a trip when given a cost per mile rate. | 9.9.1 Bill Best plans to take a 1500-mile trip and estimates a cost of 19¢ per mile. Identify the best estimate for the cost of his trip below:<br>a) \$3,000 b) \$ 300<br>c) \$ 150 d) \$1,500 |
| | 9.9.2 Estimate the cost of a trip from North Carolina to California using a cost of 20¢ per mile. |

## Introductory Algebra (Part I) Outline

1. Language of Algebra

   a. Simplify expressions.
   b. Use order of operations to simplify expressions.
   c. Convert word phrases to symbols.
   d. Evaluate expressions and formulas when replacement values are given.

2. Real Numbers

   a. Apply properties of zero and one.
   b. Use the associative and commutative properties.
   c. Apply the distributive property of multiplication over addition.

3. Number Theory

   a. Find factors of and perform divisibility tests on given numbers.
   b. Identify prime and composite numbers.
   c. Distinguish between even and odd numbers.
   d. List multiples of given numbers.

4. Fractions

   a. Find equivalent fractions and reciprocals of given fractions.
   b. Perform basic operations with numerical and algebraic fractions.

5. Linear Equations and Inequalities in One Variable

   a. Use properties of equality to solve equations.
   b. Use properties of inequality to solve inequalities.
   c. Use number lines to solve equations and inequalities.
   d. Convert words to mathematical symbols.
   e. Use formulas, ratio, proportion, and percent to solve problems.
   f. Solve equations involving absolute value.

6. Irrational Numbers

   a. Simplify square root radicals.
   b. Use in solving problems.

7. Linear Equations in Two Variables

   a. Locate points on a graph.
   b. Distinguish between relations and functions.
   c. Find the x- and y-intercepts of a line, given its equations.

8. Systems of Linear Equations with Two Variables

   a. Solve using addition and subtraction.
   b. Solve by graphing.
   c. Solve using the substitution method.
   d. Use systems of linear equations to solve problems.

9. Algebraic Fractions

   a. Simplify.
   b. Find sums and differences.
   c. Find products, conjugates, quotients.

MATHEMATICS

Grade Level: 9-12

Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 1: The learner will use the language of Algebra.

| Objectives | Measures |
|---|---|
| 1.1 Distinguish between numerical and variable expressions. | 1.1.1 Which of these is not a variable expression?<br>a) 3x b) $x^2$ c) 12-13 d) x + 7 |
| | 1.1.2 Simplify the numerical expression:<br>a) 13 + 11 b) 5x + 7x |
| 1.2 Distinguish between simplified and not simplified expressions. | 1.2.1 What is the simplified form of 19-6?<br>a) 3 b) 5 c) 13 d) 6-19 |
| | 1.2.2 One of the following is not simplified. Simplify it.<br>a) 3a - 2b b) 18 ÷ 6 |
| 1.3 Simplify numerical expressions. | 1.3.1 Simplify 179 + 2 (5 + 1)<br>a) 187 b) 190 c) 1086 d) 191 |
| | 1.3.2 Simplify 18-15 |
| 1.4 Use "order of operations" to simplify numerical expressions. | 1.4.1 Simplify $10 + 10 \cdot 10 \div 10$<br>a) 19 b) 109 c) 0 d) 20 |
| | 1.4.2 Find the value of $28 - 4 \div 2$ |
| 1.5 Use grouping symbols to indicate order of operations. | 1.5.1 $\frac{(2 + 1) \cdot 3}{9} - \frac{7 -(4 + 2)}{5 - 4}$<br>a) -51 b) 1 c) 0 d) 13 |
| | 1.5.2 Find the value of $13 \cdot (7 - 4)$ |

**COMPETENCY GOAL 1:** The learner will use the language of Algebra.

| Objectives | Measures |
|---|---|
| 1.6 Determine if a numerical expression is true. | 1.6.1 Which of these is true?<br>a) 11 x 19 = 191 b) 64 + 36 = 90<br>c) 132 ÷ 6 = 22 d) 186 - 68 = 22<br>1.6.2 Insert grouping symbols to make this sentence true.<br>2 x 3 + 4 = 14 |
| 1.7 Evaluate variable expressions. | 1.7.1 If $x = 5$, then $2x + 3 =$ ?<br>a) 28 b) 16 c) 13 d) 10<br>1.7.2 Evaluate $a \div bc$ when $a = 24$; $b = 6$; $c = 2$. |
| 1.8 Simplify exponential expressions. | 1.8.1 Which of the following is greatest?<br>a) $3^2 - 2^3$ b) $3^3 - 4^2$<br>c) $(3-2)^5$ d) $4^2 - 2^4$<br>1.8.2 Find the value of $1 + \left(\frac{1}{2}\right)^2$ |
| 1.9 Use exponents as "shorthand." | 1.9.1 $2x \cdot 2x \cdot 2x =$ ?<br>a) $6x$ b) $2(x^3)$ c) $2^3(x)$ d) $(2x)^3$<br>1.9.2 Use exponents to write $a \cdot b \cdot c \cdot a \cdot b \cdot b$ |
| 1.10 Translate word phrases into variable expressions. | 1.10.1 Billy was y years old last year. Which expression represents Billy's age 5 years from now?<br>a) $(y + 1) + 5$ b) $(y - 1) + 5$<br>c) $y + 5$ d) $y - 6$<br>1.10.2 Write an expression for the cost of 4 pencils and 3 felt-tips if pencils cost p cents each and felt-tips cost f cents each. |

MATHEMATICS

Grade Level: 9-12

Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 2: The learner will identify and apply properties of real numbers.

| Objectives | | Measures |
|---|---|---|
| **2.1 Identify and apply the special properties of zero for both addition and multiplication.** | 2.1.1 | $189 + 0 = ?$<br>a) 0 b) 189 c) -189 d) none of these |
| | 2.1.2 | $3\left(\frac{7}{8}\right)\left(5\ \frac{1}{2}\right)(0)(4) = ?$<br>a) 0 b) $17\ \frac{3}{4}$ c) $\frac{420}{16}$ d) $26\ \frac{1}{4}$ |
| **2.2 Identify and apply the special property of one in multiplication.** | 2.2.1 | If $\frac{2}{3}n = \frac{10}{15}$ then $n = ?$<br>a) $\frac{8}{12}$ b) $\frac{3}{2}$ c) $\frac{5}{5}$ d) $\frac{2}{5}$ |
| | 2.2.2 | If $\frac{3x}{5} = \frac{18}{30}$ then $x = ?$ |
| **2.3 Identify and apply the Commutative and Associative Properties of Addition.** | 2.3.1 | $12 + 389 + 88 = ?$<br>a) 389 + 100 b) (12 + 88) + 389<br>c) (88 + 12) + 389 d) All of the above |
| | 2.3.2 | Compute: $192 + 56 + 8 + 4 = ?$ |
| **2.4 Identify and apply the Commutative and Associative Properties of Multiplication.** | 2.4.1 | $(4)(29)(25) = ?$<br>a) 2784 b) 3100 c) 4621 d) 2900 |
| | 2.4.2 | $(2)(175)(25)(2) = ?$ |
| **2.5 Identify and apply the Distributive Property.** | 2.5.1 | $17 \times 498 \neq ?$<br>a) 17(300 + 198) b) 17(500-2)<br>c) (2 + 496)17 d) 17(49 + 80) |
| | 2.5.2 | Compute in the easiest way:<br>$(25)(94) + (25)(6) = ?$ |

**COMPETENCY GOAL 2:** The learner will identify and apply properties of real numbers.

| Objectives | | Measures |
|---|---|---|
| 2.6 Make algebraic applications of number properties. | 2.6.1 | $3a^2b^3+2a^3b^2+5a^3b^2-a^2b^3 = ?$<br>a) $9a^2b^3$ b) $9a^3b^2$<br>c) $8a^3b^2+a^2b^3$ d) $2a^2b^3+7a^3b^2$ |
| | 2.6.2 | $6x^2y + 3xy^2 + 8x^2y - 10xy^2 = ?$ |

# MATHEMATICS

Grade Level: 9-12

Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 3: The learner will use basic concepts of number theory.

| Objectives | Measures |
|---|---|
| 3.1 Factor whole numbers. | 3.1.1 12 has exactly __?__ whole number factors.<br>a) 0 b) 2 c) 4 d) 6 |
| | 3.1.2 List all of the factors of 28. |
| 3.2 Apply tests for divisibility by 2,3,4,5,9, and 10. | 3.2.1 Each of the following is divisible by 2,3,4,5,9, and 10 EXCEPT:<br>a) 1080 b) 360 c) 8100 d) 630 |
| | 3.2.2 Is 813 divisible by 3? |
| 3.3 Identify prime numbers. | 3.3.1 Which of the following is not a prime?<br>a) 1 b) 2 c) 3 d) 5 |
| | 3.3.2 Is 51 a prime number? |
| 3.4 Write the prime factorization of a composite number. | 3.4.1 The prime factorization of 126 is:<br>a) $1\cdot126$ b) $2\cdot63$ c) $2\cdot7\cdot9$ d) $2\cdot3^2\cdot7$ |
| | 3.4.2 Write the prime factorization of 160. |
| 3.5 Write the LCM of a set of numbers. | 3.5.1 The LCM of 3, 6, 18, and 24 is:<br>a) 24 b) 3 c) 72 d) 144 |
| | 3.5.2 Write the LCM of 10, 15, and 20. |

MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Introductory Algebra (Part I)

**COMPETENCY GOAL 4:** The learner will simplify expressions containing fractions.

| Objectives | Measures |
|---|---|
| 4.1 Write fractions in simplest terms. | 4.1.1 Write in simplest terms: $\frac{25}{205}$<br>a) $\frac{1}{10}$ b) $\frac{5}{45}$ c) $\frac{5}{41}$ d) $\frac{1}{8r5}$ |
| | 4.1.2 Write $\frac{70}{154}$ in simplest terms. |
| 4.2 Write a fraction equivalent to a given fraction. | 4.2.1 $\frac{7}{8}$ is equivalent to:<br>a) $\frac{7+1}{8+1}$ b) $\frac{7}{8}\cdot\frac{8}{7}$ c) $\frac{78}{78}$ d) $\frac{56}{64}$ |
| | 4.2.2 Complete: $\frac{3}{5} = \frac{?}{30}$ |
| 4.3 Write an algebraic fraction in simplest terms. | 4.3.1 Write in simplest terms: $\frac{24m^4n^2}{26m^2n^2}$ $(m,n \neq 0)$<br>a) $\frac{12}{13}$ b) $\frac{12m^2}{13}$ c) $\frac{3m^2n}{4m}$ d) $\frac{21m^2n}{23}$ |
| | 4.3.2 Write in simplest terms: $\frac{40x^2y}{48xy^2}$ |
| 4.4 Multiply fractions involving either numerical or algebraic expressions. | 4.4.1 Write in simplest terms: $\frac{3}{7} \times \frac{2}{3}$<br>a) $\frac{5}{10}$ b) $\frac{1}{2}$ c) $\frac{6}{21}$ d) $\frac{2}{7}$ |
| | 4.4.2 Write in simplest terms: $\frac{3}{x^2} \cdot \frac{x}{7}$, where $x \neq 0$<br>a) $\frac{3}{7x}$ b) $\frac{3x}{7x^2}$ c) $\frac{3x}{x^2 7}$ d) $\frac{3+x}{x^2+7}$ |
| 4.5 Name the reciprocal of a non-zero number. | 4.5.1 What is the reciprocal of $\frac{1}{5}$ ?<br>a) -2 b) 5 c) -5 d) $-\frac{1}{5}$ |
| | 4.5.2 What is the reciprocal of $\frac{7}{13}$ ? |

**COMPETENCY GOAL 4:** The learner will simplify expressions containing fractions.

| Objectives | Measures |
|---|---|
| **4.6 Divide fractions involving either numerical or algebraic expressions.** | 4.6.1 Divide $\frac{18}{49} \div \frac{12}{35}$ .<br>a) $\frac{15}{14}$ b) $\frac{6}{14}$ c) $\frac{14}{15}$ d) $\frac{5}{14}$ |
| | 4.6.2 Divide $\frac{x^2}{10} \div \frac{x}{15}$. |
| **4.7 Add fractions involving either numerical or algebraic expressions.** | 4.7.1 Express in simplest terms: $\frac{3}{8} + \frac{1}{6}$<br>a) $\frac{13}{24}$ b) $\frac{2}{7}$ c) $\frac{1}{2}$ d) $\frac{32}{42}$ |
| | 4.7.2 Simplify: $\frac{3m}{7} + \frac{2m}{6}$ |
| **4.8 Subtract fractions involving either numerical or algebraic expressions.** | 4.8.1 Simplify: $\frac{4}{5} - \frac{7}{15}$<br>a) $\frac{3}{10}$ b) $\frac{1}{3}$ c) $\frac{19}{15}$ d) 0 |
| | 4.8.2 Simplify: $\frac{7}{3z} - \frac{2y}{3z}$ |

MATHEMATICS

Grade Level: 9-12

Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 5: The learner will solve linear equations in one variable.

| Objectives | Measures |
|---|---|
| 5.1 Use the Subtraction Property of Equality to solve equations. | 5.1.1 If $n + 3\frac{1}{2} = 8$, then n = ?<br>a) $5\frac{1}{2}$ b) $11\frac{1}{2}$ c) $4\frac{1}{2}$ d) 9<br>5.1.2 Solve $x + 12 = 27$. |
| 5.2 Use the Addition Property of Equality to solve equations. | 5.2.1 If $95 = p - 235$, then p = ?<br>a) 95-235 b) 235-95<br>c) 95+235 d) $95 \cdot 235$<br>5.2.2 Solve $x - 17 = 73$. |
| 5.3 Use the Division Property of Equality to solve equations. | 5.3.1 If $5n = 79$, then n = ?<br>a) 79-5 b) 79+5 c) $79 \cdot 5$ d) $79 \div 5$<br>5.3.2 Solve $6x = 72$. |
| 5.4 Use the Multiplication Property of Equality to solve equations. | 5.4.1 If $\frac{t}{6} = \frac{3}{4}$, then t = ?<br>a) $\frac{3}{4}(6)$ b) $\frac{3}{4} - 6$ c) $\frac{3}{4} \div 6$ d) $\frac{3}{4} + 6$<br>5.4.2 Solve $\frac{x}{9} = \frac{2}{3}$. |
| 5.5 Use a series of properties to solve equations. | 5.5.1 If $\frac{x}{3} + 12 = 42$, then x = ?<br>a) 30 b) 270 c) 87 d) 90<br>5.5.2 Solve $3x + 5 = x + 21$. |
| 5.6 Apply the Distributive Property in solving equations. | 5.6.1 If $3(x + 1) = 12$, then<br>a) $3x + 1 = 12$ b) $3x + 3 = 36$<br>c) $4x = 12$ d) $3x + 3 = 12$<br>5.6.2 Solve $2(x - 3) + 5 = 21$. |

COMPETENCY GOAL 5: The learner will solve linear equations in one variable.

| Objectives | Measures |
|---|---|
| 5.7 Translate from words to symbols. | 5.7.1 The phrase "Twice as much as some number" may be represented by:<br>a) $x + 3$ b) $3x$ c) $x + 2$ d) $2x$ |
| | 5.7.2 The phrase "Four more then three times a number" may be represented by _________. |
| 5.8 Write equations to solve problems. | 5.8.1 Which equation fits the problem: "Twice the sum of 3 and a certain number is 15."<br>a) $2(3) + x = 15$ b) $2(x + 3) = 15$<br>c) $2x + 3 = 15$ d) $2(3 + 15) = x$ |
| | 5.8.2 Solve and check. When 21 is added to a number, the sum is 56. Find the number. |
| 5.9 Use formulas in problem solving. | 5.9.1 The formula for the perimeter of a rectangle of length $\ell$ and width $\omega$ is $P=2(\ell+\omega)$. A rectangle is 23 feet long and 17 feet wide. What is its perimeter?<br>a) 80 b) 63 c) 40 d) 391 |
| | 5.9.2 Use the formula $d = rt$ to find the distance a driver would travel in 5 hours at an average rate of 52 mph. |

MATHEMATICS

Grade Level: 9-12

Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 6: The learner will apply the concepts of ratio, proportion, and percent to practical problems.

| Objectives | Measures |
|---|---|
| 6.1 Recognize the meaning of ratio. | 6.1.1 The ratio of 3 to 2 means:<br>a) 3+2 b) 3-2 c) 3·2 d) 3÷2 |
| | 6.1.2 Write as a ratio in lowest terms: 8 months to 12 months. |
| 6.2 Solve a proportion. | 6.2.1 Solve: $\frac{8}{x} = \frac{16}{54}$<br>a) 27 b) 48 c) 432 d) 108 |
| | 6.2.2 Solve: $\frac{15}{40} = \frac{12}{d}$ |
| 6.3 Solve problems by using proportions. | 6.3.1 A ball team's Winning Percentage, P, is determined by the proportion:<br>$\frac{\text{games won}}{\text{games played}} = \frac{P}{100}$<br>If a team has 18 wins and 6 losses, what is its winning percentage?<br>a) 300 b) 1300 c) 75 d) .75 |
| | 6.3.2 Solve: The tax on a car costing $7200 is $360. At the same tax rate, what will be the the tax on a car costing $9000? |
| 6.4 Solve the three types of percent problems:<br>a. a% of b = ?<br>b. c is ?% of d.<br>c. e% of ? = f. | 6.4.1 Anna paid $5 sales tax on a purchase of $125 . What was the sales tax rate?<br>a) 25% b) 4% c) 5% d) 40% |
| | 6.4.2 A realtor gets a 5.5% commission on sales. Find the commission on the sale of a house whose selling price is $80,000. |

## MATHEMATICS

Grade Level: 9-12

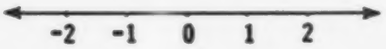
Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 7: The learner will solve linear equations with real number coefficients.

| Objectives | Measures |
|---|---|

7.1 Graph and compare integers on the number line.

7.1.1



Several integers shown on the number line and arranged from smallest to largest are:

a) -2,0,-1 b) +1,+2,+3

c) -2,-1,0 d) 0,-1,-2

7.1.2 Use < or > to compare 12 and -21.

7.2 Identify opposites of rational numbers.

7.2.1 $-(-7) = ?$

a) $-7$ b) $-(+7)$ c) $+7$ d) none of these

7.2.2 $-(11) = ?$

7.3 Write decimal forms of rational numbers.

7.3.1 $\frac{8}{9} = ?$

a) $0.\overline{8}$ b) 0.8888

c) 0.89 d) all of these

7.3.2 $\frac{3}{20} = ?$

7.4 Identify rational and irrational numbers.

7.4.1 Which of the following is not a rational number?

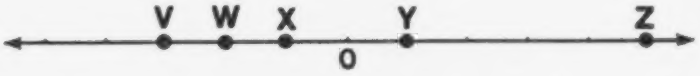
a) $\sqrt{196}$ b) $\sqrt{1024}$

c) $-\sqrt{9}$ d) $\sqrt{11}$

7.4.2 Which is a rational number -2 or $\sqrt{2}$?

7.5 Interpret absolute value geometrically.

7.5.1



Which pair of the indicated points represents real numbers with equal absolute values?

7.5.2 What do -7 and 7 have in common?

COMPETENCY GOAL 7: The learner will solve linear equations with real number coefficients.

| | Objectives | | Measures |
|---|---|---|---|
| 7.6 | Simplify numerical expressions (addition/subtraction). | 7.6.1 | Find the value: $-3 + 7 - 8(-6) + (6)(-8)$<br>a) $-12$ b) $4$ c) $-106$ d) $-92$ |
| | | 7.6.2 | Simplify: $4 + 9(-9) - (-8) + (-1)$ |
| 7.7 | Simplify variable expressions (addition/subtraction). | 7.7.1 | Simplify: $-\frac{5}{12}w + \frac{7}{6}w^2 - \frac{5}{6}w + w^2$<br>a) $\frac{13}{6}w^2 - \frac{3}{4}w$ b) $\frac{19}{24}w^3$<br>c) $\frac{13}{6}w^2 + \frac{3}{4}w$ d) $\frac{13}{6}w^2 - \frac{5}{4}w$ |
| | | 7.7.2 | Simplify: $12x^2 - 8x + 6 - 8x^2 + x - 9$ |
| 7.8 | Simplify variable expressions (multiplication/division). | 7.8.1 | Simplify: $-a^2(-3a)(-\frac{1}{3}a)$<br>a) $9a^3$ b) $a^3$ c) $-a^3$ d) $-a^4$ |
| | | 7.8.2 | $18x^2 \div (-6x) = ?$ |
| 7.9 | Solve equations. | 7.9.1 | If $4n - 5(n+2) = 6 - 3(3-n)$, then $n = ?$<br>a) $\frac{5}{2}$ b) $-\frac{5}{2}$ c) $\frac{7}{3}$ d) $-\frac{7}{4}$ |
| | | 7.9.2 | Solve: $5x - (x+12) = 3x + 2(x-1)$ |
| 7.10 | Use real number equations to solve problems. | 7.10.1 | The postage on a package is 99¢ and consists of 6-cent and 25-cent stamps. If there is one less 25-cent stamp than the number of 6-cent stamps, how many 25-cent stamps are on the package?<br>a) 4 b) 1 c) 3 d) 2 |
| | | 7.10.2 | In the Raleigh Road Race, there are 26 more runners this year than last year. The total number of runners for the two years was 5760. Find the number of runners this year. |

MATHEMATICS

Grade Level: 9-12

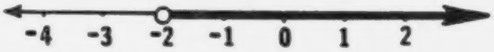
Skills/Subject Area: Introductory Algebra (Part I)

**COMPETENCY GOAL 8:** The learner will solve and graph linear inequalities.

| Objectives | Measures |
|---|---|

8.1 Graph number line inequalities.

8.1.1



The graph on the number line is:

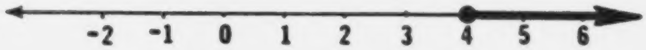
a) -2,-1,0,1,2 b) $n < 4$

c) $n \geq -2$ d) $n > -2$

8.1.2 Draw the graph of $n > 1$.

8.2 Solve inequalities and graph the solution sets.

8.2.1



This graph is the solution set of:

a) $-4w + 2 \leq -14$ b) $-4w + 2 \geq -14$

c) $w > 4$ d) $w > 5$

8.2.2 Solve and graph the solution set of $4 + x < 1$.

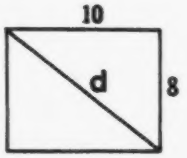
MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 9: The learner will simplify square root radicals and use square root radicals in problem solving.

| Objectives | Measures |
|---|---|
| 9.1 Distinguish between radicals and radicands. | 9.1.1 In the expression $4 - \sqrt{11}$, the radicand is:<br>a) 4 b) $\sqrt{\ }$ c) $\sqrt{11}$ d) 11<br>9.1.2 Give an example of a radical expression. |
| 9.2 Recognize and apply $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$ where a,b are non-negative. | 9.2.1 Simplify: $\sqrt{4} \cdot \sqrt{2} =$ ?<br>a) $\sqrt{42}$ b) 8<br>c) $\sqrt{8}$ d) $2\sqrt{2}$<br>9.2.2 $\sqrt{3} \cdot \sqrt{27} =$ ? |
| 9.3 Identify non-simplified square root radicals. | 9.3.1 Which is in simple radical form?<br>a) $\sqrt{8}$ b) $\sqrt{5} \cdot \sqrt{20}$<br>c) $-\sqrt{363}$ d) $\sqrt{15}$<br>9.3.2 Which is in simple radical form $2\sqrt{12}$ or $12\sqrt{2}$ ? |
| 9.4 Simplify square root radicals. | 9.4.1 Simplify: $\sqrt{180}$<br>a) $36\sqrt{5}$ b) $5\sqrt{36}$<br>c) $6\sqrt{5}$ d) $5\sqrt{6}$<br>9.4.2 Simplify: $\sqrt{128}$ |

COMPETENCY GOAL 9: The learner will simplify square root radicals and use square root radicals in problem solving.

| Objectives | | Measures |
|---|---|---|
| 9.5 Apply the Pythagorean Theorem. | 9.5.1 | Solve for d:  <br>a) 12.808 b) $4\sqrt{41}$<br>c) $41\sqrt{2}$ d) $2\sqrt{41}$ |
| | 9.5.2 | A rope 13m long is attached to the top of a flagpole. The rope is just able to reach a point on the ground 5m from the base of the pole. What is the height of the flagpole? |
| 9.6 Identify square root radicals that are not real numbers. | 9.6.1 | Which of the following does not represent a real number?<br>a) $\sqrt{2}$ b) $\sqrt{-2}$ c) $-\sqrt{2}$ d) 0 |
| | 9.6.2 | Give an example of a square root radical which is not a real number. |

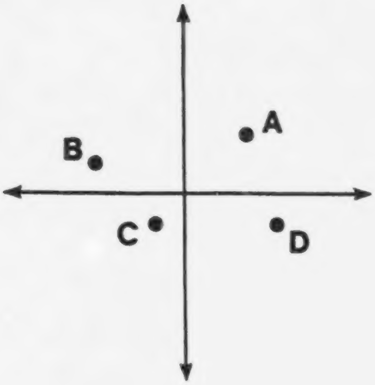
MATHEMATICS

Grade Level: 9-12

Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 10: The learner will use the coordinate plane as a model of sets of pairs of real numbers and will use models in problem solving.

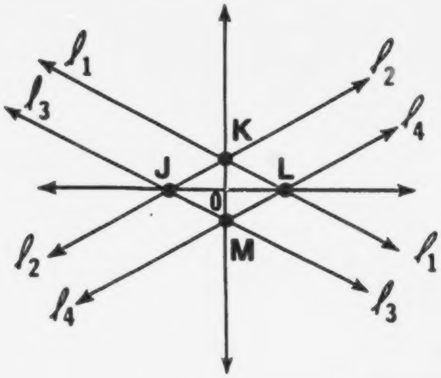
| Objectives | Measures |
|---|---|
| 10.1 Plot points in a coordinate plane. | 10.1.1 Which point is most likely to be the graph of (-3,1)? |



a) A b) B c) C d) D

10.1.1 Graph (3,-2) on a coordinate plane.

| | |
|---|---|
| 10.2 Identify intercepts as numbers. | 10.2.1 Which line has an x-intercept of -2 and a y-intercept of 1? |

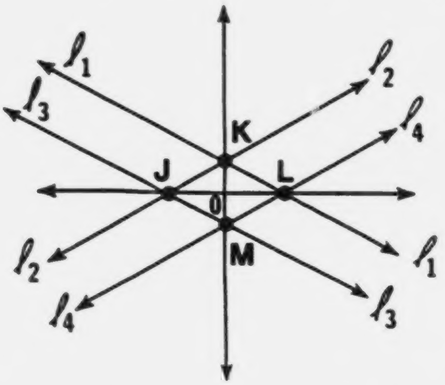


a) $\ell_1$ b) $\ell_2$ c) $\ell_3$ d) $\ell_4$

10.2.2 Use the graph to determine which line has an x-intercept of 2 and a y-intercept of 1.

**COMPETENCY GOAL 10:** The learner will use the coordinate plane as a model of sets of pairs of real numbers and will use models in problem solving.

| Objectives | Measures |
|---|---|
| **10.3 Recognize that the coordinates of the intersection of two lines lie on both lines.** | 10.3.1 Which point is on both $\ell_2$ and $\ell_3$? |



a) J b) K c) L d) M

10.3.2 Use the graph to determine which point is on both $\ell_1$ and $\ell_4$?

MATHEMATICS

Grade Level: 9-12

Skills/Subject Area: Introductory Algebra (Part I)

**COMPETENCY GOAL 11:** The learner will solve linear equations with two variables.

| Objectives | Measures |
|---|---|
| 11.1 Solve linear equations using graphs. | 11.1.1 Use graphs to determine the solution of the following system of equations:<br>$3x - 2y = 8$<br>$4x + 5y = 3$ |
| | 11.1.2 Solve by graphing: $2x - y = 4$<br>$x + y = 5$ |
| 11.2 Use linear combinations to solve systems of linear equations. | 11.2.1 Solve this system: $3x - 6y = 2$<br>$2x + 3y = 6$<br>a) $\emptyset$ b) $\left(1, 1\frac{1}{2}\right)$ c) $\left(\frac{2}{3}, 2\right)$ d) $\left(2, \frac{2}{3}\right)$ |
| | 11.2.2 Solve: $4x + 5y = -1$<br>$3x - y = 23$ |
| 11.3 Identify inconsistent systems. | 11.3.1 How many solutions does this system have?<br>$3x + 4y = 1$<br>$6x + 8y = 2$<br>a) 0 solutions b) many solutions<br>c) 1 solution d) 3 solutions |
| | 11.3.2 Solve: $2x - 3y = -12$<br>$4x - 6y = -20$ |

MATHEMATICS

Grade Level: 9-12　　Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 12: The learner will simplify expressions with algebraic fractions.

| Objectives | Measures |
|---|---|
| 12.1 Reduce algebraic fractions. | 12.1.1 Simplify: $\frac{a(x+1)}{ax}$<br>a) 2　b) x+1　c) $\frac{x+1}{x}$　d) a<br>12.1.2 Simplify: $\frac{6x(x+5)}{12x^2(x+5)}$ |
| 12.2 Use the Distributive Property to reduce fractions. | 12.2.1 Simplify: $\frac{3x+3y}{3x-3}$<br>a) $\frac{1}{-1}$　b) $\frac{x+3}{x-3}$　c) $\frac{1+y}{0}$　d) $\frac{x+y}{x-1}$<br>12.2.2 Simplify: $\frac{x^3+2x^2-3x}{2x^3+2x^2-4x}$ |
| 12.3 Compute products of algebraic fractions. | 12.3.1 Simplify: $\frac{2x-2}{3x^2} \cdot \frac{9x}{4x-4}$<br>a) $\frac{3}{2}$　b) $\frac{18x^2-18x}{12x^3-12x^2}$　c) $\frac{3}{2x}$　d) $\frac{3x}{2x^2}$<br>12.3.2 Simplify: $\frac{x^2+x-6}{x^2+7x+12} \cdot \frac{x^2+3x-4}{x^2-4}$ |
| 12.4 Compute quotients of algebraic fractions. | 12.4.1 Simplify: $\frac{2}{x-1} \div \frac{-3}{x-1}$<br>a) $-\frac{2}{3}$　b) $\frac{-6}{x-1}$　c) $-\frac{3}{2}$　d) $\frac{(x-1)^2}{-6}$<br>12.4.2 Simplify: $\frac{x^2+2x-15}{x^2-9} \div \frac{x^2-7x+6}{x^2-3x-18}$ |

**COMPETENCY GOAL 12:** The learner will simplify expressions with algebraic fractions.

| Objectives | | Measures |
|---|---|---|
| 12.5 Compute sums and differences of algebraic fractions with like binomial denominators. | 12.5.1 | Simplify: $\frac{3g+5}{g+1} + \frac{g-1}{g+1}$<br>a) $\frac{4g+4}{g+1}$ b) $\frac{8}{1}$ c) 4 d) $\frac{4g+6}{2g+2}$ |
| | 12.5.2 | Simplify: $\frac{2k+1}{k+2} - \frac{k-3}{k+2}$ |

# MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Introductory Algebra (Part I)

COMPETENCY GOAL 13: The learner will simplify expressions whose terms are polynomials and will evaluate such expressions.

| Objectives | Measures |
|---|---|
| 13.1 Recognize a polynomial that is not simplified. | 13.1.1 Which polynomial IS in simplest form?<br>a) $3r+2-5r$ b) $2x^2-4+7$<br>c) $3x^2+5x$ d) $9-21d^2+3d^4+21d^2$ |
| | 13.1.2 Why isn't $12x^2-18x+9-11x$ in simplest form? |
| 13.2 Evaluate polynomial expressions. | 13.2.1 The value of $3x^2-3x-6$ if $x = 1$ is:<br>a) 1 b) 0 c) -1 d) -6 |
| | 13.2.2 Find the value of $2x^2+4x-1$ if $x = -1$. |
| 13.3 Simplify polynomial sums. | 13.3.1 Simplify: $(3x-5x^2+3)+(x^2-2x-8)$<br>a) $-3x^3-5$ b) $-4x^2+x-5$<br>c) $6x^2+5x+11$ d) $4x^2-x-5$ |
| | 13.3.2 Simplify: $(-7x^2+6x-5)+(x^2-3x-1)$ |
| 13.4 Order a polynomial in decreasing powers of a variable. | 13.4.1 Which of the following is ordered in decreasing powers of x ?<br>a) $17-x+5x^2$ b) $5x^2+17-x$<br>c) $-x+5x^2$ d) $5x^2-x+17$ |
| | 13.4.2 Write in decreasing powers of x:<br>$12-9x^2+11x+18x^3$ |

COMPETENCY GOAL 13: The learner will simplify expressions whose terms are polynomials and will evaluate such expressions.

| Objectives | Measures |
|---|---|
| 13.5 Simplify polynomial sums in vertical presentation. | 13.5.1 Add: $\begin{array}{r} 3x^2-5x+6 \\ \underline{-3x+2x^2-4} \end{array}$<br>a) $-3x+2$ b) $5x^2-8x+2$<br>c) $6x^3-3x^3-10$ d) $13x^3+10$<br>13.5.2 Add: $\begin{array}{r} 6x^2-8x+5 \\ \underline{-2x^2+5x-3} \end{array}$ |
| 13.6 Simplify polynomial differences. | 13.6.1 Simplify: $(-2x^3+4x-1) - (x^3+4x^2-2x+5)$<br>a) $-3x^3-4x^2+6x-6$ b) $-x^3+6$<br>c) $-x^3+4x^2+2x+4$ d) $-3x^3-6$<br>13.6.2 Simplify: $(x^4-3x^2+6x-8) - (x^3+x^2-3x+7)$ |

## Introductory Algebra (Part II) Outline

1. Rational Numbers

    a. Add, subtract, multiply, and divide.
    b. Use opposites and absolute value in computations.
    c. Use correct order of operations in computation.
    d. Evaluate exponential expressions.

2. Real Numbers

    a. Distinguish between and use rational and irrational numbers.
    b. Combine like terms to evaluate rational and irrational expressions.
    c. Add, subtract, multiply, and divide.

3. Equations and Inequalities in One Variable

    a. Solve equations using properties of equality.
    b. Solve inequalities using properties of inequality.
    c. Solve equations and inequalities using multiple transformations.
    d. Solve problems, including ones with ratio, proportion, and percent.

4. Relations and Functions

    a. Plot and read graphs of functions and relations in a coordinate plane.
    b. Distinguish between a relation and a function.

5. Exponential Expressions

    a. Apply rules of exponents to simplify expressions.
    b. Use scientific notation to write large and small numbers.

6. Radical Expressions

    a. Distinguish between and use rational, real, and imaginary numbers.
    b. Find products and quotients of expressions involving square roots.
    c. Find sums of radicals and radical expressions.

7. Polynomials

    a. Add, subtract, multiply, and divide.
    b. Simplify polynomial expressions by combining like terms.
    c. Find the greatest common factor in a polynomial expression.
    d. Factor trinomials.
    e. Factor the difference of two squares.
    f. Recognize perfect square trinomials.

8. Linear Equations in Two Variables

   a. Find and plot ordered pairs on a coordinate plane.
   b. Find x- and the y-intercepts of a line in the coordinate plane.
   c. Determine the slope of a line, given its equation.
   d. Graph equations on a coordinate plane.

9. Systems of Linear Equations

   a. Solve using addition and subtraction.
   b. Solve using multiplication and division.
   c. Solve by graphing.
   d. Solve by determinants.
   e. Use systems of linear equations to solve problems.

10. Algebraic Fractions

   a. Find common factors.
   b. Find sums and differences.
   c. Determine least common multiples.
   d. Find products and quotients.

11. Quadratic Equations

   a. Graph quadratic equations.
   b. Find the zeros of a quadratic equation.
   c. Solve by factoring.
   d. Solve by completing the square.
   e. Solve by using the Quadratic Formula.

## MATHEMATICS

**Grade Level:** 10-12 **Skills/Subject Area:** Introductory Algebra (Part II)

**COMPETENCY GOAL 1:** The learner will perform operations on rational numbers, in simplifying numerical expressions.

| Objectives | Measures |
|---|---|
| 1.1 Name the opposite of a number. | 1.1.1 The opposite of $-\frac{1}{10}$ is:<br>a) -10 b) 10 c) $\frac{1}{10}$ d) $-\frac{1}{10}$<br>1.1.2 Find the opposite of -6. |
| 1.2 Interpret absolute value geometrically (as distance from zero). | 1.2.1 Which of these numbers has the greatest absolute value? -100, -50, 0, 75<br>a) -100 b) -50 c) 0 d) 75<br>1.2.2 Which of these numbers has the greatest absolute value? -60, -10, 16, 61 |
| 1.3 Perform addition of rational numbers. | 1.3.1 Add: -51 + 19<br>a) 70 b) -70 c) -32 d) 32<br>1.3.2 Add: -37 + (-13) |
| 1.4 Subtract rational numbers. | 1.4.1 Subtract: -12 from -1<br>a) 11 b) -11 c) -13 d) 13<br>1.4.2 Subtract: 9 from -3 |
| 1.5 Multiply rational numbers. | 1.5.1 Multiply: $-\frac{2}{3} \cdot \frac{4}{9}$<br>a) $-\frac{2}{3}$ b) $-\frac{8}{27}$ c) $\frac{8}{27}$ d) $\frac{2}{3}$<br>1.5.2 Multiply: $\left(-\frac{4}{5}\right)\left(-\frac{15}{28}\right)$ |

Skills/Subject Area: Introductory Algebra (Part II) Page 2

COMPETENCY GOAL 1: The learner will perform operations on rational numbers, in simplifying numerical expressions.

| | Objectives | | Measures |
|---|---|---|---|
| 1.6 | Divide rational numbers. | 1.6.1 | Divide: $-18 \div \frac{2}{3}$<br>a) 27 b) 12 c) -12 d) -27 |
| | | 1.6.2 | Divide: $-24 \div \left(-\frac{3}{4}\right)$ |
| 1.7 | Simplify expressions by "order of operations". | 1.7.1 | Simplify: $(-5)(-5) - 5 + 5 \div 5 \cdot 5$<br>a) 25 b) $20\frac{1}{5}$ c) -1 d) 1 |
| | | 1.7.2 | Simplify: $-18 + 6 \div 2 + 9 \times 3$ |
| 1.8 | Simplify and evaluate exponential expressions. | 1.8.1 | Evaluate: $2^3 \cdot a^4$, when $a = -1$.<br>a) 6 b) -6 c) 8 d) -8 |
| | | 1.8.2 | Evaluate: $3a^3$, when $a = -2$. |

MATHEMATICS

Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

**COMPETENCY GOAL 2:** The learner will identify the real number properties and apply them to numerical and algebraic expressions.

| Objectives | Measures |
|---|---|
| 2.1 Distinguish between irrational and rational numbers. | 2.1.1 Which is an irrational number?<br>a) $\sqrt{25}$ b) $\sqrt{16}$ c) $\sqrt{9}$ d) $\sqrt{2}$ |
| | 2.1.2 Give an example of a rational number. |
| 2.2 Recognize properties of addition. | 2.2.1 The following equation $(89 + 11) + 10 = 89 + (11 + 10)$ illustrates the:<br>a) Addition Property of Zero<br>b) Addition Property of Opposites<br>c) Commutative Property of Addition<br>d) Associative Property of Addition |
| | 2.2.2 Which property is illustrated by the expression: $15 + 45 = 45 + 15$? |
| 2.3 Recognize properties of multiplication. | 2.3.1 The following equation $-25 \cdot (17 \cdot 4) = (-25 \cdot 4) \cdot 17$ illustrates each of these properties except the:<br>a) Commutative Property of Multiplication<br>b) Associative Property of Multiplication<br>c) Multiplication Property of Zero<br>d) Multiplicative Identity |
| | 2.3.2 Which property is illustrated by the expression $18 \times 1 = 18$? |
| 2.4 Use the Distributive Property to simplify expressions. | 2.4.1 Multiply: $-3(a-5)$<br>a) $3a - 15$ b) $-8a$<br>c) $-3a + 15$ d) $-3a - 5$ |
| | 2.4.2 Multiply: $-8(x-2)$ |

COMPETENCY GOAL 2: The learner will identify the real number properties and apply them to numerical and algebraic expressions.

| | Objectives | | Measures |
|---|---|---|---|
| 2.5 | Use the Distributive Property to factor an expression. | 2.5.1 | Factor: $15x^2 - 3x$<br>a) $3(x^2 - x)$ b) $3x^2(5-3x)$<br>c) $3x(5x-1)$ d) $3x$ |
| | | 2.5.2 | Factor: $30x^2 - 20x + 50$ |
| 2.6 | Combine like terms. | 2.6.1 | Simplify: $-3a - 6 + 9a$<br>a) 0 b) $6a-6$ c) $18a^2$ d) $162a^2$ |
| | | 2.6.2 | Simplify: $7x + 8y + (-5x) + (-16y)$ |

## MATHEMATICS

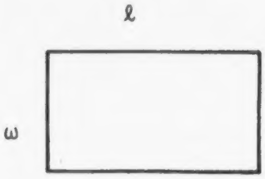
Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 3: The learner will solve linear equations over the set of real numbers.

| Objectives | Measures |
|---|---|
| 3.1 Use the Addition Property of Equality to solve an equation. | 3.1.1 If $p-12 = -7$, then $p = ?$<br>a) -19 b) 19 c) -5 d) 5 |
| | 3.1.2 Solve: $x - 19 = 6$ |
| 3.2 Use the Subtraction Property of Equality to solve an equation. | 3.2.1 If $x + 7 = -9$ then $x = ?$<br>a) -16 b) 16 c) -2 d)2 |
| | 3.2.2 Solve: $x + 12 = 36$ |
| 3.3 Use the Multiplication Property of Equality to solve an equation. | 3.3.1 If $\frac{x}{-10} = 20$, then $x = ?$<br>a) 2 b) -2 c) -200 d) 200 |
| | 3.3.2 Solve: $\frac{x}{6} = -16$ |
| 3.4 Use the Division Property of Equality to solve an equation. | 3.4.1 If $2x = 80$, then $x = ?$<br>a) 40 b) 72 c) 160 d) 82 |
| | 3.4.2 Solve: $3y = 75$ |
| 3.5 Use multiple transformations to solve an equation. | 3.5.1 If two transformations are used in the equation $4x - 3 = 77$, the result is:<br>a) $x = 10$ b) $4x = 80$<br>c) $x = 20$ d) $4x - 6 = 74$ |
| | 3.5.2 Solve: $7x - 4 = 10$ |
| 3.6 Combine similar terms in equations. | 3.6.1 Which member of this equation is simplified? $-3x + 17 - 2x = 30 + x$<br>a) the left side b) the right side<br>c) both sides d) neither side |
| | 3.6.2 Solve: $3x + x - 6 = 50$ |

COMPETENCY GOAL 3: The learner will solve linear equations over the set of real numbers.

| Objectives | Measures |
|---|---|
| 3.7 Solve equations of the form $ax + b = cx + d$. | 3.7.1 Solve: $5y + 2 = 3y + 10$<br>a) 1 b) 4<br>c) 6 d) none of these<br>3.7.2 Solve: $6x + 8 = 4x - 12$ |
| 3.8 Write equations to solve problems. | 3.8.1  <br>$p = 2\ell + 2\omega$<br>The perimeter of a rectangle is 24 meters. The length is 8 meters longer than the width. Which equation fits the description?<br>a) $24w = 8$ b) $2(8 + w)$<br>c) $24 = 2(w+8) + 2w$ d) none of the above<br>3.8.2 Write an equation to show how to solve the following problem:<br>One more than five times a number is 26. What is the number? |
| 3.9 Translate words into equations and solve. | 3.9.1 A parking lot has spaces for 500 cars. The number of spaces for compacts is 35 more than half the spaces for standard cars. How many spaces for compacts does the lot have?<br>a) 310 b) 155 c) 285 d) 190<br>3.9.2 Nine less than 3 times a number is 21. Find the number. |

COMPETENCY GOAL 3: The learner will solve linear equations over the set of real numbers.

| Objectives | Measures |
|---|---|
| 3.10 Solve problems involving ratios. | 3.10.1 The ratio of the length to the width of the U.S. flag is 19:10. What is the length of a flag with perimeter 87 inches?<br>a) 58 in. b) 19 in.<br>c) 28.5 in. d) 33.5 in. |
| | 3.10.2 The ratio of the two acute angles in a right triangle is 2:3. Find the measure of the smaller angle. |
| 3.11 Solve problems involving percents. | 3.11.1 A concert was a sell-out. Of the tickets sold, 65% cost \$8.00 each, and the rest were \$10 each. The number of \$8.00 tickets exceeded the number of \$10.00 tickets by 960. How much money was taken in?<br>a) \$27,840 b) \$1120<br>c) \$2080 d) \$32,000 |
| | 3.11.2 A store manager lists the selling price of a color television set at \$390. The profit is 30% of the cost. Find the cost. |

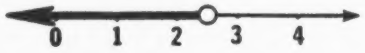
MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Introductory Algebra (Part II)

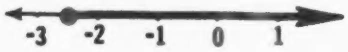
COMPETENCY GOAL 4: The learner will solve linear inequalities.

| Objectives | Measures |
|---|---|
| 4.1 Graph an inequality. | 4.1.1 Which of these is the graph of $x < 2\frac{1}{2}$ ? $(x \in R)$ |

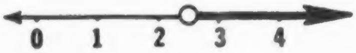
a)



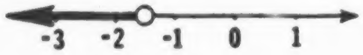
b)



c)



d)



4.1.2 Draw the graph of $x \geq 2\frac{1}{2}$ $(x \in R)$

| Objectives | Measures |
|---|---|
| 4.2 Solve inequalities. | 4.2.1 If $-6 < -\frac{3}{2}x$, then |

a) $4 < x$  b) $4 > x$  c) $-9 < x$  d) $9 > x$

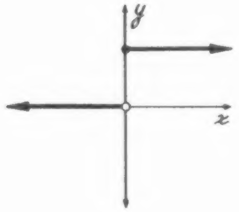
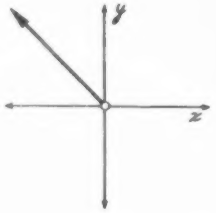
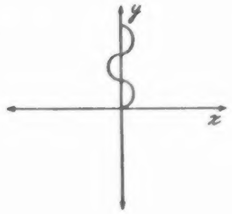
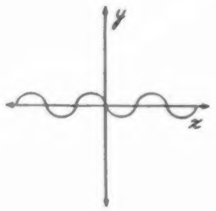
4.2.2 Solve: $3x - 5 \geq x + 7$

# MATHEMATICS

Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 5: The learner will plot and read graphs of functions and relations in a coordinate plane.

| Objectives | Measures |
|---|---|
| 5.1 Identify components and characteristics of the coordinate plane. | 5.1.1 Which of the following are coordinates of a point in Quadrant III of the coordinate plane?<br>a) (1, 1) b) (-1, 1)<br>c) (-1, -1) d) (1, -1)<br>5.1.2 In which quadrant is (-2, -2)? |
| 5.2 Distinguish between sets of ordered pairs that are functions and those that are relations. | 5.2.1 Which of the following sets of ordered pairs is not a function?<br>a) {(0, 0), (1, 1), (-1, 1)}<br>b) {(0, 1), (1, 1), (-1, 1)}<br>c) {(0, 0), (0, 1), (0, -1)}<br>d) {(0, 0), (1, 1), (2, -1)}<br>5.2.2 Determine whether or not the relation is a function: {(-1, -1), (-2, -2), (0, 0), (1, 1)} |
| 5.3 Identify graphs of functions. | 5.3.1 Which of the following is not the graph of a function?<br>a)  <br>b)  <br>c)  <br>d)  <br>5.3.2 Connect the points (0,0), (0,1), (1,1) and (1,0). Is this the graph of a function? |

MATHEMATICS

Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 6: The learner will operate with powers.

| Objectives | Measures |
|---|---|
| 6.1 Use the property of products of powers. | 6.1.1 Written with a single exponent, $6^6 \cdot 6^3 =$ ? <br> a) $6^{18}$ b) $36^9$ c) $6^9$ d) $6^2$ <br> 6.1.2 Simplify: $2^5 \cdot 2^2$ |
| 6.2 Use the property of quotients of powers. | 6.2.1 Simplify: $6^6 \div 6^3$ <br> a) $1^3$ b) $6^3$ c) $6^9$ d) $6^2$ <br> 6.2.2 Simplify: $2^8 \div 2^4$ |
| 6.3 Simplify expressions with powers. | 6.3.1 Simplify: $(-1)^{1984}$ <br> a) 1 b) 0 c) -1 d) 1984 <br> 6.3.2 Simplify: $2^5$ |
| 6.4 Interpret zero as an exponent. | 6.4.1 Simplify: $(-5)^0$ <br> a) 1 b) 0 c) 5 d) -5 <br> 6.4.2 Simplify: $(2a)^0$ |
| 6.5 Interpret negative exponents. | 6.5.1 Simplify: $3^{-2}$ <br> a) -9 b) -6 c) $\frac{1}{9}$ d) 9 <br> 6.5.2 Simplify: $2^{-3}$ |
| 6.6 Simplify expressions involving powers of powers. | 6.6.1 Simplify: $(x^3)^3 =$ ? <br> a) $x^6$ b) $x^9$ c) 6x d) 9x <br> 6.6.2 Simplify: $(x^2)^4$ |

COMPETENCY GOAL 6: The learner will operate with powers.

| Objectives | Measures |
|---|---|
| 6.7 Simplify expressions involving several properties of powers. | 6.7.1 Simplify: $\frac{(2^3s^2t^4)^3}{r}$ |
| | a) $\frac{64s^5t^7}{r^7}$ b) $\frac{512s^6t^{12}}{r}$ |
| | c) $\frac{512s^6t^{12}}{r^3}$ d) $\frac{8s^3t^9}{r}$ |
| | 6.7.2 Simplify: $\left(\frac{4x^3y^2}{2xy}\right)^2$ |
| 6.8 Read and interpret scientific notation. | 6.8.1 In scientific notation 12345 = ? |
| | a) $1.2345 \times 10^{-4}$ b) $123.45 \times 10^2$ |
| | c) $12.345 \times 10^3$ d) $1.2345 \times 10^4$ |
| | 6.8.2 Write 186,000 in scientific notation. |

# MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 7: Simplify real radical expressions.

| Objectives | Measures |
|---|---|
| 7.1 Identify numbers with rational square roots. | 7.1.1 Which of the following does not have a rational square root?<br>a) 0 b) 1 c) 9 d) 13 |
| | 7.1.2 Which of the following has a rational square root? 2 or 64 |
| 7.2 Identify numbers that have real square roots. | 7.2.1 All of the following have a real square root except:<br>a) 2 b) 1 c) 0 d) -1 |
| | 7.2.2 Which of the following has a real square root, -16 or 2? |
| 7.3 Simplify products of square root radicals. | 7.3.1 Simplify: $\sqrt{\frac{2}{3}} \cdot \sqrt{6}$<br>a) $\frac{1}{3}\sqrt{12}$ b) $12\sqrt{3}$ c) $-2$ d) $2$ |
| | 7.3.2 Simplify: $\sqrt{\frac{3}{5}} \cdot \sqrt{\frac{45}{27}}$ |
| 7.4 Simplify quotients of square root radicals. | 7.4.1 Simplify: $\frac{-\sqrt{34}}{\sqrt{17}}$<br>a) $\sqrt{2}$ b) $\sqrt{-2}$ c) $-\sqrt{2}$ d) $-2$ |
| | 7.4.2 Simplify: $\frac{\sqrt{128}}{\sqrt{2}}$ |
| 7.5 Simplify square root radicals. | 7.5.1 Which of the following is in simple radical form?<br>a) $\sqrt{12}$ b) $3\sqrt{4}$ c) $2\sqrt{3}$ d) $3\sqrt{12}$ |
| | 7.5.2 Simplify: $\sqrt{48}$ |

**COMPETENCY GOAL 7: Simplify real radical expressions.**

| Objectives | Measures |
|---|---|
| 7.6 Simplify sums of radical expressions. | 7.6.1 Simplify: $\sqrt{32} + \sqrt{18}$<br>a) $7\sqrt{2}$ b) $2\sqrt{7}$ c) $5\sqrt{2}$ d) $\sqrt{50}$<br>7.6.2 Simplify: $3\sqrt{5} - 3\sqrt{20}$ |
| 7.7 Approximate square roots. | 7.7.1 $\sqrt{3}$ is between:<br>a) 2 and 3 b) 2 and 4<br>c) 0 and 1 d) 1 and 2<br>7.7.2 Use a table of square roots or a calculator to find $\sqrt{17}$ to three decimal places. |

# MATHEMATICS

Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 8: The learner will operate with polynomials.

| Objectives | Measures |
|---|---|
| 8.1 Recognize monomials and distinguish them from algebraic fractions. | 8.1.1 Which of the following is *not* a monomial?<br>a) 3 b) $\frac{1}{3}$ c) $x^9$ d) $\frac{3}{x}$<br>8.1.2 Which of the following is a monomial?<br>$\frac{x^2}{3}$ or $\frac{3}{x^2}$ |
| 8.2 Simplify polynomials. | 8.2.1 Simplify: $3x^3y - 5 + xy^3 + 2x^3y$<br>a) $5x^3y + xy^3 - 5$ b) $5xy^3 - 5$<br>c) $6x^3y - 5$ d) $x^7y^5$<br>8.2.2 Simplify: $2x^2y - 7xy^2 + 8x^2y - 3xy^2$ |
| 8.3 Add and subtract polynomials. | 8.3.1 Simplify: $(x^2 - 3x + 4) - (3x^2 + 5x - 7)$<br>a) $4x^2 + 8x + 11$ b) $-2x^2 - 8x + 11$<br>c) $4x^2 + 2x - 3$ d) $-2x^2 + 2x - 3$<br>8.3.2 Simplify: $(x^2 - 10x + 9) - (2x^2 - 6x + 8)$ |
| 8.4 Multiply polynomials. | 8.4.1 Multiply: $(5x - 2)(x - 3)$<br>a) $5x^2 - 17x + 6$ b) $5x^2 - 13x - 6$<br>c) $5x^2 - 17x - 5$ d) $5x^2 + 6$<br>8.4.2 Multiply: $(3x - 1)(x + 2)$ |
| 8.5 Divide polynomials. | 8.5.1 Divide: $(4a^3 - 3a - 1) \div (2a + 1)$<br>a) $2a^2 - 1$ b) $2a^2 + 1$<br>c) $2a^2 - a - 1$ d) $2a^2 + a + 1$<br>8.5.2 Divide: $(x^2 - 8x - 20) \div (x + 2)$ |

MATHEMATICS

Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 9: The learner will factor polynomials.

| Objectives | Measures |
|---|---|
| 9.1 Recognize the GCF of a polynomial. | 9.1.1 Find the GCF of $10x^4 - 15x^3 + 5x^2$<br>a) $5(2x^4 - 3x^3 + x^2)$ b) $5x^2 (2x^2 - 3x)$<br>c) $5x^2 (2x^2 - 3x + 1)$ d) 0<br>9.1.2 Factor: $3x^2y - 6xy - 18$ |
| 9.2 Identify terms having special names. | 9.2.1 In $3b^4 - 2b^3 + b^2 + 2b + 3$ the coefficient of the quadratic term is:<br>a) 3 b) -2 c) 2 d) 1<br>9.2.2 Name the coefficient of the cubic term in the expression:<br>$2x^4 - 5x^3 + x^2 - 7x - 8$ |
| 9.3 Factor trinomials. | 9.3.1 Which of the following is a factor of $x^2 - 5x + 6$?<br>a) $(x - 6)$ b) $(x + 1)$<br>c) $(x - 2)$ d) $(x + 2)$<br>9.3.2 Factor: $x^2 - 11x + 30$ |
| 9.4 Factor the difference of two squares. | 9.4.1 Factor: $4x^2 - 1$<br>a) $(2x - 1)^2$ b) $(2x + 1)^2$<br>c) $(4x - 1)(x + 1)$ d) $(2x + 1)(2x - 1)$<br>9.4.2 Factor: $9x^2 - 16$ |
| 9.5 Factor a trinomial square. | 9.5.1 Which of the following is a trinomial square?<br>a) $x^2 + 10x + 36$ b) $x^2 - 20x - 100$<br>c) $4x^2 + 9$ d) $x^2 - 2x + 1$<br>9.5.2 Factor: $x^2 - 12x + 36$ |

Skills/Subject Area: Introductory Algebra (Part II) Page 2

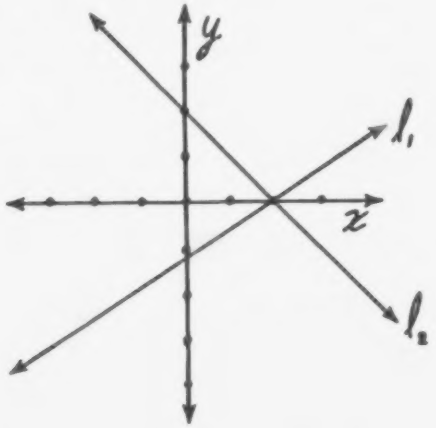
COMPETENCY GOAL 9: The learner will factor polynomials.

| Objectives | Measures |
|---|---|
| 9.6 Use quadratic methods to factor higher order polynomials. | 9.6.1 The prime factorization of $x^4 - 1$ has exactly __?__ factors.<br>a) 4 b) 3 c) 2 d) 1 |
| | 9.6.2 Factor: $x^4 - 8x^2 + 9$ |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Introductory Algebra (Part II)

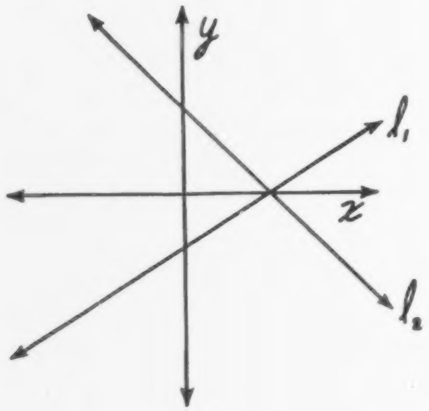
COMPETENCY GOAL 10: The learner will analyze linear equations.

| Objectives | Measures |
|---|---|
| 10.1 Determine if an ordered pair is a solution of a given linear equation. | 10.1.1 (3, 2) is a solution of<br>a) $x + 2y = 7$ b) $x - 2y = 7$<br>c) $2x + y = 7$ d) $2x - y = 7$<br>10.1.2 Is (-2, 3) a solution of $2x - y = 7$? |
| 10.2 Find the y-intercept of a linear equation. | 10.2.1 The y-intercept of $y = 3x - 2$ is:<br>a) 1 b) 3 c) -2 d) (0, 3)<br>10.2.2 Find the y-intercept of $2x - y = 4$ |
| 10.3 Find the intercepts of the graph of a linear equation. | 10.3.1 The x-intercept of $\ell_1$ is:<br><br> <br>a) 0 b) 2 c) 3 d) -2<br>10.3.2 Find the x and y-intercepts of $3x + 2y = 6$ |

Skills/Subject Area: Introductory Algebra (Part II) Page 2

COMPETENCY GOAL 10: The learner will analyze linear equations.

| Objectives | | Measures |
|---|---|---|
| 10.4 Determine the slope of a line from its graph. | 10.4.1 | |



$\ell_1$ (above) has ___?___ slope.

a) no b) positive d) negative d) 0

10.4.2 What is the slope of $\ell_2$ in the graph pictured for 10.4.1?

10.5 Determine the slope of a line from its equation.

10.5.1 The slope of the line whose equation is $2x - y = -4$ is:

a) 2 b) -2 c) $\frac{1}{2}$ d) $-\frac{1}{2}$

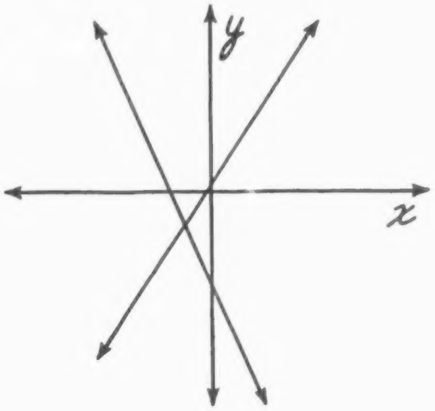
10.5.2 Find the slope of the line whose equation is $2x - 5y = 10$

MATHEMATICS

Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

**COMPETENCY GOAL 11:** The learner will employ graphic and algebraic techniques to solve systems of linear equations (in two variables).

| Objectives | Measures |
|---|---|
| 11.1 Identify linear equations. | 11.1.1 Which is not a linear equation?<br>a) $x = 0$ b) $y = 0$<br>c) $xy = 0$ d) $x - y = 0$<br>11.1.2 a) Is $xy + 5 = 0$ a linear equation?<br>b) Is $x + y + 5 = 0$ a linear equation? |
| 11.2 Write linear equations in standard form. | 11.2.1 $y = 2x - 3$ in standard form is:<br>a) $2x + y - 3 = 0$ b) $2x - y = 3$<br>c) $2x = y + 3$ d) none of these<br>11.2.2 Write $3x = 2y + 5$ in standard form. |
| 11.3 Solve a system of two linear equations by graphing. | 11.3.1 Write the solution set of the system from its graph.<br><br> <br>a) (1, 1) b) (-1, 1)<br>c) (1, -1) d) (-1, -1)<br>11.3.2 Solve by graphing: $x - 2y = 0$<br>$x + y = 3$ |

COMPETENCY GOAL 11: The learner will employ graphic and algebraic techniques to solve systems of linear equations (in two variables).

| Objectives | | Measures | |
|---|---|---|---|
| 11.4 | Solve a system of two linear equations by the substitution method. | 11.4.1 | Solve by the substitution method: $y = x - 3$<br>$x + y = 1$<br>a) (2, -1) b) (-1, 2)<br>c) (-2, 1) d) (-2, -1) |
| | | 11.4.2 | Solve by the substitution method: $y = 3x - 4$<br>$x + 2y = -1$ |
| 11.5 | Solve systems of equations by linear combinations. | 11.5.1 | Solve: $2x - 3y = -1$<br>$-3x + 5y = 2$<br>a) (0, 1) b) (1, 1)<br>c) (1, -1) d) (-1, -1) |
| | | 11.5.2 | Solve: $x - 7y = 15$<br>$2x - y = 4$ |
| 11.6 | Use linear systems to solve problems. | 11.6.1 | If the sum of two numbers is 28 and their difference is 6, then the larger number is:<br>a) 11 b) 17 c) -11 d) -17 |
| | | 11.6.2 | Find two numbers whose sum is 26 and whose difference is 14. |

## MATHEMATICS

Grade Level: 10-12

Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 12: The learner will simplify rational expressions.

| Objectives | Measures |
|---|---|
| 12.1 Simplify a simple rational expression. | 12.1.1 Simplify: $\frac{x^2 + x}{x^2 + 2x + 1}$<br>a) $\frac{2}{4}$ b) $\frac{1}{2}$ c) $\frac{x}{x+1}$ d) $\frac{x+1}{x^2}$<br>12.1.2 Simplify: $\frac{x^2 + 2x}{x^2 + x - 2}$ |
| 12.2 Simplify products of rational expressions. | 12.2.1 Simplify: $\left(\frac{x}{x+1}\right) \bullet \left(\frac{x+1}{x^2}\right)$<br>a) $\frac{x}{x^2}$ b) $\frac{x^2+x}{x^3+x^2}$ c) $\frac{1+x}{3}$ d) $\frac{1}{x}$<br>12.2.2 Simplify: $\frac{x^2 - 2x}{x^2 - 4} \bullet \frac{x^2 + 4x + 4}{x + 2}$ |
| 12.3 Simplify quotients of rational expressions. | 12.3.1 Simplify: $\frac{x - 2}{x} \div \frac{x - 2}{5}$<br>a) $\frac{x^2 - 4x + 4}{5x}$ b) $\frac{5}{x}$<br>c) $\frac{x - 2}{5}$ d) $\frac{5}{x-2}$<br>12.3.2 Divide: $\frac{x^2 + x - 6}{x^2 - 2x + 1} \div \frac{x - 2}{x - 1}$ |
| 12.4 Determine the LCM of two polynomials. | 12.4.1 The least common multiple of $t^2 - 4$ and $t + 2$ is:<br>a) $t + 2$ b) $t - 2$<br>c) $t^2 + 4$ d) $t^2 - 4$<br>12.4.2 Find the LCM of $x^2 - 5x + 6$ and $x^2 - x - 6$ |

**COMPETENCY GOAL 12:** The learner will simplify rational expressions.

| Objectives | Measures |
|---|---|
| 12.5 Add rational expressions. | 12.5.1 Add: $\frac{3}{x} + \frac{2}{x-2}$<br>a) $\frac{-1}{x-2}$ b) $\frac{5}{x(x-2)}$<br>c) $\frac{5x-6}{x(x-2)}$ d) $\frac{5x-6}{x}$ |
| | 12.5.2 Add: $\frac{x}{x^2-4} + \frac{1}{x^2-5x+6}$ |
| 12.6 Subtract rational expressions. | 12.6.1 Subtract: $\frac{x+3}{x-1} - \frac{x-1}{x+3}$<br>a) $-4$ b) $\frac{4}{2x+2}$<br>c) $\frac{4}{2}$ d) $\frac{8(x+1)}{(x-1)(x+3)}$ |
| | 12.6.2 Subtract: $\frac{3}{x^2-9} - \frac{1}{x-3}$ |

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Introductory Algebra (Part II)

COMPETENCY GOAL 13: The learner will solve quadratic equations.

| Objectives | Measures |
|---|---|
| 13.1 Identify whether or not a given rule describes a quadratic equation. | 13.1.1 Which is a quadratic equation:<br>a) $y = 2x - 1$ b) $y = x^3 + 2x$<br>c) $y = x^2 + x - 2$ d) $y = \frac{1}{x}$<br>13.1.2 Is $y = x^2 - x - 6$ a quadratic equation? |
| 13.2 Write a quadratic equation in standard form. | 13.2.1 $x^2 - 2x - 1 = 2$ in standard form is:<br>a) $x^2 - 2x + 1 = 0$ b) $x^2 - 2x - 3 = 0$<br>c) $-2x + x^2 - 3 = 0$ d) $x^2 = 0$<br>13.2.2 Write $y = (x-1)^2 + 5$ in standard form. |
| 13.3 Solve a quadratic equation by factoring. | 13.3.1 Solve: $x^2 - 2x - 3 = 0$ by factoring.<br>a) $(3, 1)$ b) $(-3, 1)$ c) $(3, -1)$ d) $\left(\frac{1}{3}, -1\right)$<br>13.3.2 Factor: $x^2 - 3x - 54 = 0$ |

COMPETENCY GOAL 13: The learner will solve quadratic equations.

| | Objectives | | Measures |
|---|---|---|---|
| 13.4 | Solve a quadratic equation by completing the square. | 13.4.1 | To solve $x^2 - 8x - 9 = 0$ by completing the square, what must be added to both sides of the equation?<br>a) 25 b) 16 c) 4 d) 8 |
| | | 13.4.2 | Solve by completing the square:<br>$x^2 - 10x = 14$ |
| 13.5 | Use the quadratic formula to solve a quadratic equation. | 13.5.1 | Solve by using the quadratic formula:<br>$x^2 - 4x + 1 = 0$<br>a) $(-2 + \sqrt{3}, -2 - \sqrt{3})$<br>b) $(2 + \sqrt{3}, 2 - \sqrt{3})$<br>c) $(-4, 1)$<br>d) $(-5, 1)$ |
| | | 13.5.2 | Solve by using the quadratic formula:<br>$x^2 - 6x + 1 = 0$ |

## Algebra I Outline

1. Language of Algebra
    a. Simplify and evaluate expressions.
    b. Use order of operations to evaluate expressions.
    c. Convert word phrases into mathematical symbols.
    d. Evaluate formulas.

2. Rational Numbers
    a. Use the commutative and associative properties.
    b. Use the distributive property of multiplication over addition.
    c. Identify and use the multiplicative inverse of a given number.
    d. Compare two rational numbers.
    e. Convert fractions to decimals and vice versa.

3. Relations and Functions
    a. Graph relations and functions using number lines and the rectangular coordinate plane.
    b. Graph linear equations and inequalities.
    c. Graph using the slope-intercept method.
    d. Find square roots using a table or a calculator.
    e. Find the union and intersection of sets.

4. Linear Equations and Inequalities in One Variable
    a. Use the addition and subtraction properties of equality and inequality.
    b. Use the multiplication and division properties of equality and inequality.
    c. Solve equations and inequalities with fractional coefficients.
    d. Solve equations involving absolute values.
    e. Solve problems.

5. System of Linear Equations
    a. Solve by using addition and subtraction.
    b. Solve by the substitution method.
    c. Solve by graphing.
    d. Use systems of linear equations to solve problems.

6. Polynomials
    a. Add and subtract.
    b. Multiply monomials and powers of monomials.
    c. Multiply and divide polynomials.
    d. Factor polynomials.

7. Quadratic Equations

   a. Solve by factoring.
   b. Solve by completing the square.
   c. Use the Quadratic Formula to solve.
   d. Use quadratic equations to solve problems.

8. Algebraic Fractions

   a. Simplify.
   b. Solve proportions.
   c. Multiply and divide.
   d. Add and subtract.
   e. Solve equations with algebraic fractions.
   f. Use proportions and algebraic fractions to solve problems.

9. Radical Expressions

   a. Simplify products and quotients.
   b. Simplify sums and differences.
   c. Solve equations containing radical expressions.

## MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 1: The learner will use the language of Algebra.

| Objectives | Measures |
|---|---|
| 1.1 Simplify numerical expressions. | 1.1.1 Simplify (75 ÷ 5) ÷ (10 - 5)<br>a) 14 b) 0.3 c) -3.5 d) 3<br>1.1.2 Simplify 120 - (10 x 6) = ________ |
| 1.2 Evaluate variable expressions. | Evaluate each expression if a = 2, b = 3, c = 4, and d = 0.<br>1.2.1 ab - cd<br>a) 6 b) 24 c) 8 d) 2<br>1.2.2 ac + bd = ________________ |
| 1.3 Evaluate exponential expressions. | Write each expression in exponential form.<br>1.3.1 6 · x · x · x · y · y · z<br>a) $6xyz^6$ b) $6x^2yz^3$<br>c) $6x^3y^2z$ d) 36xyz<br>1.3.2 3 · x · x · y = _______ |
| 1.4 Use "order of operations" to evaluate expressions. | Simplify each expression.<br>1.4.1 18 + 12 ÷ 3<br>a) 22 b) 10 c) 27 d) 33<br>1.4.2 (21 + 4) - 8 ÷ 2 = ______ |
| 1.5 Evaluate formulas when the replacement values are given. | 1.5.1 Use the formula I = prt to find the interest (I), when p = $1200, r = 10%, t = 1 yr.<br>a) $12 b) $1320 c) $1210 d) $120<br>1.5.2 Use the formula V = l · w · h to find the volume of a rectangular solid, when l = 6, w = 2, h = 3. |

| Objectives | Measures |
|---|---|
| 1.6 Convert word phrases into symbols. | Represent each sentence by an equation.<br>1.6.1 The sum of the number x and four is nine.<br>a) $4x = 9$ b) $x + 4 = 9$<br>c) $x - 4 = 9$ d) $x = 4 + 9$<br>1.6.2 If one is added to three times the number n, the sum is 16. |

## MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 2: The learner will use the structural properties of number systems.

| Objectives | Measures |
|---|---|
| 2.1 Use the Commutative Property of Addition to simplify expressions or computational processes with real numbers. | 2.1.1 Complete the statement.<br>$93 + 7 = \underline{\qquad} + 93$<br>a) 7 b) 100 c) 86 d) 651<br>2.1.2 $18 + 182 = 182 + \underline{\qquad}$ |
| 2.2 Use the Associative Property of Addition to simplify expressions or computational processes with real numbers. | Simplify each expression.<br>2.2.1 $176 + 14 + 85$<br>a) 190 b) 99 c) 265 d) 275<br>2.2.2 $317 + 39 + 21$ |
| 2.3 Use the Distributive Property of Multiplication over Addition to simplify expressions or computational processes with real numbers. | Simplify each expression.<br>2.3.1 $84\ (73 + 27)$<br>a) 100 b) 6132 c) 8400 d) 2268<br>2.3.2 $78 \cdot 26 + 78 \cdot 34 = \underline{\qquad\qquad}$ |
| 2.4 Use the reciprocal, or Multiplicative Inverse, of a number to simplify expressions or computational processes with real numbers. | Simplify each expression.<br>2.4.1 $6\ ab \left(-\frac{1}{6}\right)$<br>a) $-ab$ b) $ab$ c) $-36\ ab$ d) $5\frac{5}{6}\ ab$<br>2.4.2 $24\ (ab)\left(-\frac{1}{4}\right) = \underline{\qquad\qquad}$ |

COMPETENCY GOAL 2: The learner will use the structural properties of number systems.

| Objectives | Measures |
|---|---|
| 2.5. Use the Commutative Property of Multiplication to simplify expressions or computational processes with real numbers. | Name the property illustrated.<br>2.5.1 (3a)(7) = (7)(3a)<br>a) Closure Property for Multiplication<br>b) Commutative Property for Multiplication<br>c) Associative Property for Multiplication<br>d) Distributive Property<br>2.5.2 (11a)(5b) = (5b)(11a) |
| 2.6 Use the Associative Property of Multiplication to simplify expressions or computational processes with real numbers. | Simplify:<br>2.6.1 $\frac{1}{2}(6x)$<br>a) $6\frac{1}{2}$ b) 3x<br>c) 12x d) $5\frac{1}{2}x$<br>2.6.2 $1\frac{1}{7}(21a) =$ _____ |
| 2.7 Use the Distributive Property to simplify expressions. | Simplify:<br>2.7.1 5 (a + 3)<br>a) a + 15 b) 5a + 3<br>c) 15a d) 5a + 15<br>2.7.2 18 (x + 2y) = _____ |

# MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

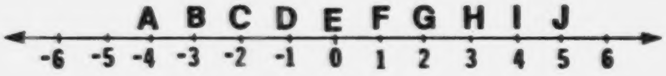
COMPETENCY GOAL 3: The learner will perform operations with rational numbers.

| Objectives | Measures |
|---|---|
| 3.1 Use < or > to compare two rational numbers. | Replace the ? with <, =, or > to make a true statement.<br>3.1.1 $\frac{1}{6}$ ? $\frac{7}{30}$<br>a) = b) < c) > d) none of these<br>3.1.2 $\frac{15}{16}$ ? $\frac{29}{31}$ |
| 3.2 Express rational numbers in fraction or decimal form. | 3.2.1 Express $\frac{3}{8}$ as a terminating or repeating decimal.<br>a) 0.375 b) $0.\overline{375}$<br>c) $0.\overline{3}$ d) 0.38<br>3.2.2 Express $0.\overline{2}$ as a fraction in lowest terms. |

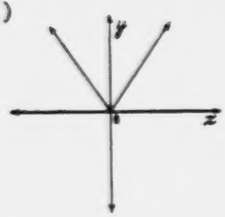
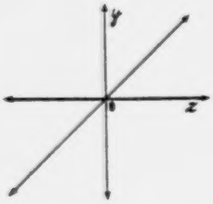
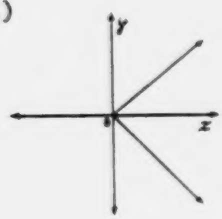
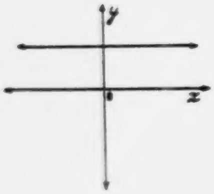
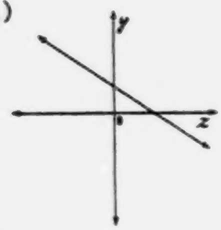
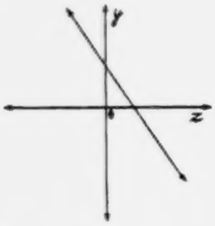
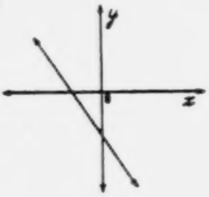
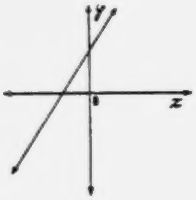
## MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 4: The learner will locate numbers on the number line or rectangular coordinate plane.

| Objectives | Measures |
|---|---|
| 4.1 Graph sets of real numbers on the number line. | List the letters for the points whose coordinates are given.<br><br> <br>4.1.1 -3,3<br>a) B,G b) B,H c) E,H d) C,H<br>4.1.2 4, -1 |
| 4.2 Use the number line to add real numbers. | Simplify each expression. If necessary, draw a number line to help you.<br>4.2.1 8 + (-6)<br>a) -2 b) 14 c) 2 d) -14<br>4.2.2 (-3) + (-5) = __________ |
| 4.3 Graph ordered pairs of numbers on the coordinate plane. | 4.3.1 In which quadrant is the graph of (-1,5)?<br>a) I b) II c) III d) IV<br>4.3.2 Plot the graph of (-3, -2) |
| 4.4 Graph a relation on the coordinate plane. | 4.4.1 What is the graph of the relation A = { (5,1), (-3,2), (3,-2) } ?<br>a) a point b) three points on the coordinate plane<br>c) a line d) three line segments<br>4.4.2 Graph the relation B = {(0,2), (3,-4)}. |

COMPETENCY GOAL 4: The learner will locate numbers on the number line or rectangular coordinate plane.

| Objectives | Measures |
|---|---|
| *4.5 Use the "vertical line test" to determine if a relation is a function. | 4.5.1 Tell which graph is not a function.<br>a)  <br>b)  <br>c)  <br>d)  <br>4.5.2 Does the graph of $x = y^2+1$ represent a function? |
| 4.6 Graph a linear equation in two variables. | 4.6.1 Which is the graph of $2x + 3y = 6$?<br>a)  <br>b)  <br>c)  <br>d)  <br>4.6.2 Draw the graph of $x - 2y = 4$. |

COMPETENCY GOAL 4: The learner will locate numbers on the number line or rectangular coordinate plane.

| Objectives | Measures |
|---|---|

4.7 Graph a line given its slope and y - intercept.

4.7.1 Find the y - intercept of the line whose equation is $x - 2y = 6$.

a) 3 b) $\frac{1}{3}$

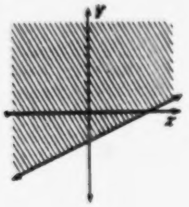
c) -3 d) -12

4.7.2 Draw the graph of a line whose slope is $\frac{1}{2}$ and y - intercept is 1.

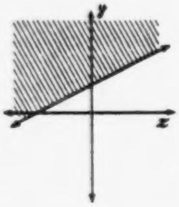
*4.8 Graph a linear inequality in two variables.

4.8.1 Which is the graph of the inequality $x - 2y \leq 4$?

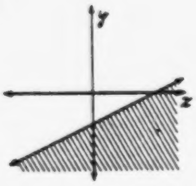
a)



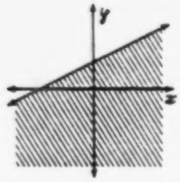
b)



c)



d)



d)

4.8.2 Draw the graph of $2x - y > 4$.

*4.9 Graph the solution set of a system of linear inequalities.

4.9.1 Which point belongs to the graph of the solution set of the system:

$y \geq 2$

$x - y > 2$

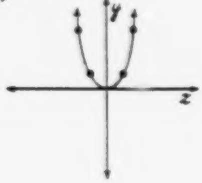
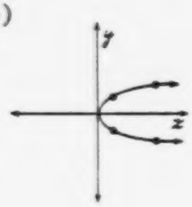
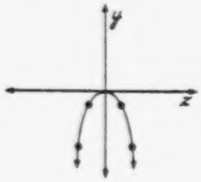
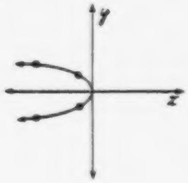
a) (0,0) b) (4,2) c) (8,2) d) (4,-2)

4.9.2 Graph the solution set of the system:

$y \leq 2$

$x - y < 2$

**COMPETENCY GOAL 4:** The learner will locate numbers on the number line or rectangular coordinate plane.

| Objectives | Measures |
|---|---|
| *4.10 Graph a quadratic equation. | 4.10.1 Which is the graph of $y = x^2$?<br>a)  <br>b)  <br>c)  <br>d)  <br>4.10.2 Draw the graph of $y = x^2 - 5x + 6$ |
| *4.11 Use the discriminant to determine the number of roots of an equation of the form<br>$y = ax^2 + bx + c = 0$. | 4.11.1 How many real roots does $x^2 - 5x - 6 = 0$ have?<br>a) 0 b) 1 c) 2 d) 3<br>4.12.2 How many real roots does $x^2 - 4x + 4 = 0$ have? |

MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 5: The learner will perform operations with real numbers.

| Objectives | Measures |
|---|---|
| 5.1 Determine the opposite, or additive inverse, of a number. | 5.1.1 State the additive inverse of (-2).<br>a) $-2$ b) $\frac{1}{2}$<br>c) $-\frac{1}{2}$ d) $2$ |
| | 5.1.2 State the additive inverse of (-6). |
| 5.2 Find the absolute value of a number. | 5.2.1 Simplify $\|2-6\|$<br>a) -4 b) 4 c) 8 d) -8 |
| | 5.2.2 Simplify $\|9-3\|$ |
| 5.3 Use < or > to compare two numbers. | 5.3.1 Which of the following statements is true?<br>a) $-3 > 0$ b) $-3 > 3$<br>c) $-3 < 1$ d) $3 < 0$ |
| | 5.3.2 Write a true statement using -2, 6, and > . |
| 5.4 Add real numbers. | 5.4.1 Simplify -2 + 6.<br>a) -8 b) 4 c) -4 d) -8 |
| | 5.4.2 Simplify -3 + (-2). |
| 5.5 Subtract real numbers. | 5.5.1 Simplify -1 - (-3).<br>a) -4 b) -2 c) 4 d) 2 |
| | 5.5.2 Simplify 2 - (-1). |
| 5.6 Multiply real numbers. | 5.6.1 Simplify (-2)(-1)(-4).<br>a) 8 b) -7 c) -8 d) 7 |
| | 5.6.2 Simplify (-3)(2)(-5)(4). |

**COMPETENCY GOAL 5:** The learner will perform operations with real numbers.

| Objectives | Measures |
|---|---|
| 5.7 Divide real numbers. | 5.7.1 Simplify $-27 \div (-3)$.<br>a) 9 b) -9 c) -30 d) 81<br>5.7.2 Simplify $-24 \div (-6)$. |
| 5.8 Distinguish between rational and irrational numbers. | 5.8.1 Which is an irrational number?<br>a) $\sqrt{9}$ b) $-\sqrt{16}$<br>c) $\sqrt{2}$ d) $2.\overline{5}$<br>5.8.2 Is $\sqrt{72}$ an irrational number? |
| 5.9 Find the square root of a number which is a perfect square. | 5.9.1 Find $\sqrt{289}$ .<br>a) 17 b) 13 c) 23 d) 27<br>5.9.2 Find $\sqrt{256}$ . |
| 5.10 Use a calculator, table of square roots, or an algorithm to find a decimal approximation for the square root of a real number. | 5.10.1 Approximate $\sqrt{2100}$ to the nearest hundredth using a calculator.<br>a) 14.49 b) 44.94<br>c) 45.03 d) 45.83<br>5.10.2 Approximate $\sqrt{3400}$ to the nearest tenth using a calculator. |
| 5.11 Find the union and intersection of two sets of numbers. | 5.11.1 Let $A = \{0, 1, 2, 3\}$ and<br>$B = \{2, 3, 4\}$ then<br>$A \cup B =$ __________.<br>a) $\{2,3\}$ b) $\{0,1,2,3,4\}$<br>c) $\{1,2,3\}$ d) $\{2,3,4\}$<br>5.11.2 $A \cap B =$ ________. |

MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 6: The learner will solve linear equations.

| Objectives | Measures |
|---|---|
| 6.1 Find the solution set of an open sentence when replacement values are given for the variable. | 6.1.1 Solve $2x - 1 = 7$ if $x \in \{2,3,4,5\}$.<br>a) $\{3\}$ b) $\{2\}$<br>c) $\{5\}$ d) $\{4\}$<br>6.1.2 Solve $3x - 2 = 10$ if $x \in \{2,3,4,5\}$. |
| 6.2 Solve a simple equation by using the addition property of equality. | 6.2.1 Solve $y - 6 = 8$.<br>a) 14 b) 2<br>c) -14 d) -2<br>6.2.2 Solve $x - 11 = 15$. |
| 6.3 Solve a simple equation by using the subtraction property of equality. | 6.3.1 Solve $x + 3 = 7$.<br>a) -14 b) 4<br>c) 10 d) -10<br>6.3.2 Solve $x + 2 = 9$. |
| 6.4 Solve a simple equation by using the multiplication property of equality. | 6.4.1 Solve $\frac{x}{3} = 6$.<br>a) 2 b) 3<br>c) $\frac{1}{2}$ d) 18<br>6.42 Solve $\frac{x}{4} = 5$. |
| 6.5 Solve a simple equation by using the division property of equality. | 6.5.1 Solve $18x = -72$.<br>a) -90 b) -4<br>c) $-\frac{1}{4}$ d) -54<br>6.5.2 Solve $-5y = 60$. |

COMPETENCY GOAL 6: The learner will solve linear equations.

| Objectives | Measures |
|---|---|
| 6.6 Solve an equation by using more than one property of equality. | 6.6.1 Solve $2t + 1 = 15$.<br>a) -7 b) -8<br>c) 8 d) 7<br>6.6.2 Solve $4x - 3 = 57$. |
| 6.7 Solve an equation which contains similar terms. | 6.7.1 Solve $3x - x + 2 = 10$.<br>a) 3 b) 4<br>c) -3 d) -4<br>6.7.2 Solve $5x + 2x - 4 = 24$. |
| 6.8 Solve an equation which has the variable in both members. | 6.8.1 Solve $k - 6 = 22 - 3k$.<br>a) -14 b) 7<br>c) 8 d) -7<br>6.8.2 Solve $3x + 2 = 5x + 6$. |
| 6.9 Solve "age", "coin", and "integer" problems. | 6.9.1 Mary has a collection of 23 coins worth $4.35. If the collection consists of nickels and quarters, how many nickels does she have?<br>a) 7 b) 16<br>c) 12 d) 9<br>6.9.2 Find two consecutive odd integers whose sum is 76. |
| 6.10 Solve an equation in which the numerical coefficient is a fraction. | 6.10.1 Solve $\frac{2}{3}x + 5 = \frac{x}{4} + 10$.<br>a) 60 b) 11<br>c) 12 d) -8<br>6.10.2 Solve $\frac{4x}{3} + \frac{5-x}{2} = 10$. |

COMPETENCY GOAL 6: The learner will solve linear equations.

| Objectives | | Measures |
|---|---|---|
| 6.11 Solve problems involving percents. | 6.11.1 | At a pre-season sale, a $180 coat was sold for $150. What is the percent of discount?<br>a) 30% b) $16\frac{2}{3}\%$<br>c) 20% d) 15% |
| | 6.11.2 | A sporting goods store bought a set of golf clubs for $210 and sold them for $325. What was the percent of mark-up? |
| 6.12 Solve "percent-mixture", "investment", "uniform motion", and "rate-of-work" problems. | 6.12.1 | How many kilograms of water should be mixed with 40 kg of a 30% acid solution to make a 10% acid solution?<br>a) 20 kg b) 40 kg<br>c) 60 kg d) 80 kg |
| | 6.12.2 | Working together, Doug and Barbara can do a job in 6 hours. Barbara is able to do the job in 10 hours. How long does it take Doug to do the job if he works alone? |

# MATHEMATICS

Grade Level: 8-12　　Skills/Subject Area: Algebra I

COMPETENCY GOAL 7: The learner will solve linear inequalities.

| Objectives | Measures |
|---|---|
| 7.1 Find the solution set for a linear inequality when replacement values are given for the variables. | Solve each inequality if $x \in \{-3,-2,-1,0,1,2,3\}$.<br>7.1.1 $3x < 6$<br>a) $\{-3,-2,-1,0,1\}$　b) $\{-3,-2\}$<br>c) $\{-3,-2,-1,0\}$　d) $\{-3\}$<br>7.1.2 $2x + 1 > -1$ |
| 7.2 Solve a linear inequality by using transformations. | 7.2.1 Solve $4x - 1 > 2x + 7$.<br>a) $x \geq 3$　b) $x < -3$<br>c) $x < -4$　d) $x > 4$<br>7.2.2 Solve $3x - 7 > 5x + 9$. |
| *7.3 Use inequalities to solve verbal problems. | 7.3.1 The sum of two consecutive odd integers is greater than 66. Find the pair with the smallest sum.<br>a) 31,33　b) 32,34<br>c) 31,35　d) 33,35<br>7.3.2 Of all pairs of consecutive even integers whose sum is less the 70. find the pair whose sum is greatest. |
| *7.4 Find the solution set of combined inequalities. | 7.4.1 Solve the inequality: $-3 \leq x - 1 < 2$.<br>a) $-4 \leq x < 3$　b) $-2 \leq x < 3$<br>c) $-4 \leq x < 1$　d) $-2 \leq x < 1$<br>7.4.2 Solve the inequality: $-5 < 1 - 3x \leq 7$. |

## MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 8: The learner will demonstrate an understanding of, and solve systems of linear equations.

| Objectives | Measures |
|---|---|
| 8.1 Find the slope of a nonvertical line given the graph of a line, or an equation of the line, or two points on the line. | 8.1.1 Find the slope of the line that passes through the points (3,-1) and (-2,4).<br>a) -1 b) $\frac{3}{5}$<br>c) $\frac{5}{3}$ d) -5<br>8.1.2 Find the slope of the line whose equation is $x-2y = 4$. |
| 8.2 Write the slope-intercept form of an equation of a line. | 8.2.1 Write the slope-intercept form of the line with slope 2 and y-intercept -4.<br>a) $y = 2x - 4$ b) $y = 2x + 4$<br>c) $y = 4x - 2$ d) $y = 4x + 2$<br>8.2.2 Find the slope and y-intercept of the line whose equation is $2x -4y = 1$. |
| 8.3 Write the equation of a line given the slope and one point on the line, or two points on the line. | 8.3.1 Write an equation of the line which passes through the point (2,5) and has a slope of -1.<br>a) $x + y = 3$ b) $x - y = 7$<br>b) $x - y = 3$ d) $x + y = 7$<br>8.3.2 Write an equation of the line which passes through the points (-1,3) and (2,4). |
| 8.4 Find the solution set of open sentences in two variables when given replacement sets for the variables. | 8.4.1 Which ordered pair is a solution of $2x - 3y = 2$?<br>a) (2,2) b) (4,2)<br>c) $\left(-\frac{1}{2}, \frac{1}{3}\right)$ d) (1,-1)<br>8.4.2 Is (2,-1) a solution of $x - 2y = 4$? |

COMPETENCY GOAL 8: The learner will demonstrate an understanding of, and solve systems of linear equations.

| Objectives | Measures |
|---|---|
| 8.5 Use a graph to find the solution of a pair of linear equations in two variables. | Solve by the graphic method:<br>8.5.1 $x + y = 6$<br>$x - y = 2$<br>a) (5,1) b) (4,2)<br>c) (3,1) d) (2,4)<br>8.5.2 Show graphically the solution of:<br>$x - y = 1$<br>$x = 5 - y$ |
| 8.6 Use the substitution method to find the solution of a pair of linear equations in two variables. | Solve by the substitution method:<br>8.6.1 $x + 2y = 3$<br>$2x - y = -4$<br>a) (3,0) b) (1,-2)<br>c) (-2,-1) d) (-1,2)<br>8.6.2 $x + 3y = 2$<br>$2x - y = 11$ |
| 8.7 Use the addition or subtraction method to find the solution of a pair of linear equations in two variables. | Solve by the addition or subtraction method:<br>8.7.1 $3x - 2y = 25$<br>$2x + 2y = 10$<br>a) (1, -1) b) (3,2)<br>c) (7,-2) d) (-1,-4)<br>8.7.2 $x + y = 4$<br>$2x - y = 5$ |

COMPETENCY GOAL 8: The learner will demonstrate an understanding of, and solve systems of linear equations.

| Objectives | Measures |
|---|---|
| 8.8 Use multiplication with the addition or subtraction method to solve systems of linear equations. | Solve by using multiplication with the addition or subtraction method:<br>8.8.1 $5x + 6y = 16$<br>$2x + 3y = 7$<br>a) $(3, \frac{1}{6})$ b) $(\frac{1}{2}, 2)$<br>c) $(8,-4)$ d) $(2,1)$<br>8.8.2 $2x - 3y = 2$<br>$x + 2y = -6$ |
| *8.9 Use systems of pairs of linear equations to solve certain kinds of puzzle problems (digit, age, fraction, uniform-motion, coin, mixture). | Solve by using a system of two equations in two variables:<br>8.9.1 The ten's digit of a two-digit number is twice the unit's digit. The digits are reversed if 36 is subtracted from the number. What is the original number?<br>a) 36 b) 48<br>c) 84 d) 63<br>8.9.2 The denominator of a fraction exceeds the numerator by 6. If 1 is added to the numerator, a new fraction is obtained whose value is $\frac{2}{3}$. Find the original fraction. |

MATHEMATICS

**Grade Level:** 8-12 Skills/Subject Area: Algebra I

**COMPETENCY GOAL 9:** The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 9.1 Add polynomials. | Simplify:<br>9.1.1 $(5x^2 -3x -2) + (2x^2 - x + 5)$<br>a) $7x^2 -4x + 3$<br>b) $7x^2 -4x - 7$<br>c) $3x^2 -2x - 7$<br>d) $7x^2 + 3$<br>9.1.2 $(7a^4-2a^3-5a + 6) + (a^4-a^3+9a - 2)$ |
| 9.2 Subtract polynomials. | Simplify:<br>9.2.1 $(3x^2-x-10) - (-x^2-5x+3)$<br>a) $4x^2-6x-7$ b) $4x^2+5x-13$<br>c) $2x^2-6x-7$ d) $4x^2+4x-13$<br>9.2.2 $(4a^3-2a^2-6) - (a^3-5a^2-9)$ |
| 9.3 Multiply monomials. | Simplify:<br>9.3.1 $(6x^2y)(-5xy^2)(-x^2y^2)$<br>a) $-30x^4y^4$ b) $30x^4y^4$<br>c) $-60x^4y^4$ d) $30x^5y^5$<br>9.3.2 $(4n^4)(5n^3)(6n^5)$ |
| 9.4 Find an indicated power of a monomial. | Simplify:<br>9.4.1 $(-3a^3)^2$<br>a) $9a^9$ b) $9a^5$<br>c) $9a^6$ d) $-9a^6$<br>9.4.2 $(-xy^2)^3$ |

COMPETENCY GOAL 9: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 9.5 Multiply a polynomial by a monomial. | Multiply:<br>9.5.1 $6a^5(a^3-2a-7)$<br>a) $30a^8-12a^6-42a^5$<br>b) $6a^8-12a^6-42a^5$<br>c) $6a^8-12a^5-42$<br>d) $6a^8-54a^5$<br>9.5.2 $4x^2y(x^2y^2-xy-6)$ |
| 9.6 Multiply two polynomials. | Multiply:<br>9.6.1 $(x-1)(x^2+x-2)$<br>a) $x^3-3x+2$ b) $x^3-2x^2-2x+2$<br>c) $x^3-x+2$ d) $x^3-3x-2$<br>9.6.2 $(a+3)(a^2+7a-6)$ |
| 9.7 Factor a monomial. | Find the prime factorization.<br>9.7.1 360<br>a) $2^3 \cdot 3^2 \cdot 5$<br>b) $2^3 \cdot 3 \cdot 5^2$<br>c) $2^2 \cdot 3 \cdot 5^2$<br>d) $2^2 \cdot 3^2 \cdot 5^2$<br>9.7.2 240 |
| 9.8 Divide two monomials. | Simplify:<br>9.8.1 $\frac{96x^4}{16x^2}$<br>a) $6x$ b) $\frac{6}{x^2}$ c) $6x^2$ d) $\frac{x^2}{6}$<br>9.8.2 $\frac{84x^2y^3}{-7xy}$ |

COMPETENCY GOAL 9: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 9.9 Divide a polynomial by a monomial. | Divide:<br>9.9.1 $\frac{8a^2b^3-12a^3b^2}{4a^2b^2}$<br>a) $2b - 3a^3b^2$ b) $2a^2b - 3ab$<br>c) $2ab - 3$ d) $2b - 3a$<br>9.9.2 $\frac{4a^2b^3 - 16a^3b^2}{4ab^2}$ |
| 9.10 Divide a polynomial by a binomial. | Divide:<br>9.10.1 $\frac{x^2-6x-7}{x+1}$<br>a) $x + 7$ b) $x - 6$<br>c) $x + 6$ d) $x - 7$<br>9.10.2 $\frac{x^3-3x^2+2x-6}{x-3}$ |
| 9.11 Find a common monomial factor in a polynomial. | Factor each polynomial as the product of its greatest monomial factor and another polynomial.<br>9.11.1 $8xy^2-24x^2y-32x^2y^2$<br>a) $8x\ (y^2-3xy-4xy^2)$<br>b) $8xy\ (y-3x-4xy)$<br>c) $8\ (xy^2-3x^2y-4x^2y^2)$<br>d) $8xy^2\ (1-7x)$<br>9.11.2 $45a^4b^2 - 75a^3b + 30a^2$ |
| 9.12 Find the product of the sum and difference of two numbers. | Multiply:<br>9.12.1 $(k + 7)\ (k - 7)$<br>a) $k^2 + 49$ b) $k^2 - 14k - 49$<br>c) $k^2 - 14k + 49$ d) $k^2 - 49$<br>9.12.2 $(2k + 9)\ (2k - 9)$ |

COMPETENCY GOAL 9: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 9.13 Factor the difference of two squares. | Factor:<br>9.13.1 $x^2-64$<br>a) $(x + 8)^2$<br>b) $(x - 4)(x + 16)$<br>c) $(x - 2)(x + 32)$<br>d) $(x + 8)(x - 8)$<br>9.13.2 $9x^2 - 25$ |
| 9.14 Square a binomial without using long multiplication. | Multiply:<br>9.14.1 $(x - 5)^2$<br>a) $x^2 - 25$ b) $x^2 + 25$<br>c) $x^2 - 10x + 25$ d) $x^2 + 10x + 25$<br>9.14.2 $(x + 7)^2$ |
| 9.15 Factor a perfect square trinomial. | Factor:<br>9.15.1 $x^2 - 12x + 36$<br>a) $(x - 6)^2$ b) $(x + 6)^2$<br>c) $(x + 6)(x - 6)$ d) $(x - 9)(x - 4)$<br>9.15.2 $x^2 + 10x + 25$ |
| 9.16 Find the product of two binomials. | 9.16.1 Multiply $(c - 8)(c + 3)$<br>a) $(c^2-11c-11)$ b) $(c^2-5c-11)$<br>c) $(c^2-5c-24)$ d) $(c^2+5c-24)$<br>9.16.2 Multiply $(c - 9)(c + 2)$ |

COMPETENCY GOAL 9: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 9.17 Factor a quadratic trinomial when the coefficient of the quadratic term is one. | Factor:<br>9.17.1 $x^2 - 5x - 36$<br>a) $(x - 9)(x + 4)$<br>b) $(x - 4)(x - 9)$<br>c) $(x + 9)(x - 4)$<br>d) $(x - 12)(x + 3)$<br>9.17.2 $x^2 + 5x - 14$ |
| 9.18 Factor a quadratic trinomial when the coefficient of the quadratic term is not one. | Factor:<br>9.18.1 $3x^2 + 5x - 2$<br>a) $(3x + 1)(x - 2)$<br>b) $(3x - 1)(x - 2)$<br>c) $(3x - 1)(x + 2)$<br>d) $(3x + 1)(x + 2)$<br>9.18.2 $2x^2 - 3x - 14$ |
| 9.19 Factor polynomials using more than one method of factoring. | Factor completely:<br>9.19.1 $5x^4 + 8x^3 - 4x^2$<br>a) $x^2 (5x^2 + 8x - 4)$<br>b) $x^2 (5x - 4)(x + 2)$<br>c) $x^2 (5x + 2)(x - 2)$<br>d) $x^2 (5x - 2)(x +2)$<br>9.19.2 $x^4 - 10x^2 + 9$ |

## MATHEMATICS

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 10: The learner will solve quadratic equations.

| Objectives | Measures |
|---|---|
| 10.1 Solve a second degree equation when one member is in factored form and the other member is zero. | Solve:<br>10.1.1 $(x - 4)(2x + 1) = 0$<br>a) $\{4,2\}$ b) $\{4,-1\}$<br>c) $\{-4, \frac{1}{2}\}$ d) $\{4, -\frac{1}{2}\}$<br>10.1.2 $(x - 4)(x + 3) = 0$ |
| 10.2 Solve a second degree equation by factoring. | Solve:<br>10.2.1 $x^2 - x - 6 = 0$<br>a) $\{-3,2\}$ b) $\{-2,3\}$<br>c) $\{3\}$ d) $\{2\}$<br>10.2.2 $a^2 = 4a + 5$ |
| 10.3 Use factoring to solve a verbal problem. | 10.3.1 A rectangle is 4 cm longer than it is wide. If the area is 96 cm$^2$, find the length.<br>a) 8 cm b) 12 cm<br>c) 16 cm d) 6 cm<br>10.3.2 The altitude of a triangle is 5 cm shorter than its base. Find the altitude if the area of the triangle is 42 cm$^2$. |
| 10.4 Solve a quadratic equation that is in the form perfect square equal to a constant. | Solve:<br>10.4.1 $x^2 = 36$<br>a) $\{6\}$ b) $\{-6,6\}$<br>c) $\{36,1\}$ d) $\{-36,1\}$<br>10.4.2 $(x-7)^2 = 9$ |

**Skills/Subject Area:** Algebra I

**COMPETENCY GOAL 10:** The learner will solve quadratic equations.

| Objectives | Measures |
|---|---|
| *10.5 Solve a quadratic equation by completing the square. | Solve by completing the square.<br>10.5.1 $a^2-4a-12 = 0$<br>a) {2,-6} b) {-3,4}<br>c) {3,-4} d) {-2,6}<br>10.5.2 Solve $x^2 - 6x + 5 = 0$ by completing the square. |
| *10.6 Use the Quadratic Formula to solve quadratic equations. | Solve by the Quadratic Formula.<br>10.6.1 $x^2 - 5x - 84 = 0$<br>a) {7,12} b) {-7,12}<br>c) {-7,-12} d) {-12,7}<br>10.6.2 $2x^2 - 7x + 5 = 0$ |
| *10.7 Use quadratic equations to solve problems. | Solve:<br>10.7.1 A 50-foot rope is used to enclose a rectangular flower bed that has an area of 100 square feet. Find the dimensions of the flower bed.<br>a) 5 ft., 20 ft. b) 10 ft., 10 ft.<br>c) 4 ft., 25 ft. d) none of these<br>10.7.2 The length of a rectangle is 3 times its width. Increasing the width by 2m and the length by 4m doubles the area of the rectangle. What is the perimeter of the original rectangle? |

## MATHEMATICS

**Grade Level:** 8-12 **Skills/Subject Area:** Algebra I

**COMPETENCY GOAL 11:** The learner will perform operations with algebraic fractions.

| Objectives | Measures |
|---|---|
| 11.1 Write an algebraic fraction in its simplest form. | Express in simplest form.<br>11.1.1 $\frac{4x + 8y}{4x + 4y}$<br>a) 4 b) 2<br>c) 1 + 2y d) $\frac{x + 2y}{x + y}$<br>11.1.2 $\frac{x^2 - 5x}{x^2 - 25}$ |
| 11.2 Solve proportions. | Solve:<br>11.2.1 $\frac{25}{12} = \frac{15x}{36}$<br>a) 3 b) $\frac{1}{5}$ c) 5 d) 2<br>11.2.2 $\frac{7x - 5}{4} = \frac{x + 9}{3}$ |
| 11.3 Use ratios and proportions to solve problems. | Solve:<br>11.3.1 The tax on a new car costing \$9,200 is \$368. At the same tax rate, what will the tax be on a new car costing \$10,400?<br>a) \$408 b) \$416<br>c) \$420 d) \$396<br>11.3.2 A truck can pump 1000 L of gasoline in 30 minutes. How much gasoline can it pump in 2 hours? |

COMPETENCY GOAL 11: The learner will perform operations with algebraic fractions.

| Objectives | Measures |
|---|---|
| 11.4 Multiply algebraic fractions. | Multiply and Simplify:<br>11.4.1 $\frac{x^2 - 4}{(x+2)^2} \cdot \frac{x^2 + 4}{x-2}$<br>a) $x + 2$ b) $\frac{x^2 + 4}{x - 2}$<br>c) $\frac{x^2 + 4}{x + 2}$ d) $\frac{x + 2}{x - 2}$<br>11.4.2 $\frac{5}{a^2-2a-15} \cdot \frac{a^2 -9}{10a -30}$ |
| 11.5 Divide algebraic fractions. | Divide and Simplify:<br>11.5.1 $\frac{3x^2}{7} \div \frac{(6x)^2}{21}$<br>a) $\frac{1}{4}$ b) $4$<br>c) $\frac{1}{4x}$ d) $\frac{3}{4}$<br>11.5.2 $\frac{a^2 - 9}{a^2-a-2} \div \frac{a - 3}{2a+2}$ |
| 11.6 Simplify algebraic expressions involving multiplication and division of algebraic fractions | Simplify:<br>11.6.1 $\frac{6x}{6x-14} \cdot \frac{9x-21}{21} \div \frac{x^2}{35}$<br>a) $\frac{15}{x}$ b) $\frac{15x}{7}$<br>c) $\frac{30x}{7}$ d) $\frac{30}{7x}$<br>11.6.2 $\frac{x^2}{x^2-9} \cdot \frac{x-3}{x+3} \div \frac{x}{(x+3)^2}$ |

COMPETENCY GOAL 11: The learner will perform operations with algebraic fractions.

| Objectives | Measures |
|---|---|
| 11.7 Add and subtract algebraic fractions. | Simplify:<br>11.7.1 $\frac{x + 1}{3} + \frac{2x - 3}{3}$<br>a) $\frac{3x -2}{10}$ b) $x$<br>c) $x - 2$ d) $\frac{3x -2}{3}$<br>11.7.2 $\frac{3x -2}{10} + \frac{4x -1}{5}$ |
| 11.8 Change a mixed expression to an algebraic fraction and a fraction to a mixed expression. | Write as a fraction in simplest form.<br>11.8.1 $5 - \frac{2x - 3}{x + 1}$<br>a) $\frac{3x + 2}{x + 1}$ b) $\frac{7x - 8}{x + 1}$<br>c) $\frac{7x + 2}{x + 1}$ d) $\frac{3x + 8}{x + 1}$<br>11.8.2 $\frac{4x - 5}{2} + 1$ |
| 11.9 Solve fractional equations. | Solve:<br>11.9.1 $\frac{2}{x^2 - 1} - \frac{3}{x+1} = \frac{1}{x-1}$<br>a) No solution b) $\{1\}$<br>c) $\{-1\}$ d) $\{-1,1\}$<br>11.9.2 $\frac{5}{w-3} - \frac{1}{6} = \frac{3}{w-4}$ |

## MATHEMATICS

**Grade Level:** 8-12 **Skills/Subject Area:** Algebra I

**COMPETENCY GOAL 12:** The learner will simplify expressions which contain radicals.

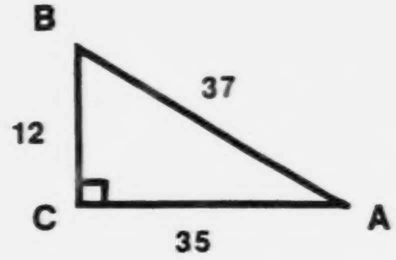
| Objectives | Measures |
|---|---|
| 12.1 Simplify products and quotients of radical expressions. | Express in simplest form.<br>12.1.1 $\sqrt{9} \cdot \sqrt{16}$<br>a) 12 b) 48 c) 36 d) 7<br>12.1.2 $\dfrac{\sqrt{240}}{\sqrt{15}}$ |
| 12.2 Simplify sums and differences of radical expressions. | Simplify:<br>12.2.1 $\sqrt{16} + 4\sqrt{2} - \sqrt{32}$<br>a) $4 + 8\sqrt{2}$ b) $4 - 8\sqrt{2}$<br>c) 8 d) 4<br>12.2.2 $3\sqrt{5} - 5\sqrt{3} + 2\sqrt{20} - \sqrt{12}$ |
| *12.3 Multiply two binomials which contain square roots. | Express in simplest form.<br>12.3.1 $(3 + \sqrt{2})(3 - \sqrt{2})$<br>a) -1 b) $9 - \sqrt{2}$ c) $9 - 9\sqrt{2}$ d) 7<br>12.3.2 $(2 - \sqrt{5})^2$ |
| *12.4 Solve simple equations which which contain radicals. | Solve:<br>12.4.1 $\sqrt{x} - 3 = 6$<br>a) 9 b) 27 c) 81 d) 12<br>12.4.2 $\sqrt{x-2} - 1 = 4$ |

Grade Level: 8-12 Skills/Subject Area: Algebra I

COMPETENCY GOAL 13: The learner will identify geometric figures, parts of figures, and solve problems related to them.

| Objectives | | Measures | |
|---|---|---|---|
| *13.1 | Classify angles as acute, right, or obtuse. | 13.1.1 | Which angle is an acute angle?<br>a) $\angle A = 95^\circ$ b) $\angle B = 71^\circ$<br>c) $\angle C = 90^\circ$ d) $\angle D = 100^\circ$ |
| | | 13.1.2 | Give an example of an obtuse angle. |
| *13.2 | Identify vertical, adjacent, complementary and supplementary angles. | 13.2.1 | Find the measure of the supplement of a 36° angle.<br>a) 154 b) 64 c) 54 d) 144 |
| | | 13.2.2 | Find the complement of a 47° angle. |
| *13.3 | Solve problems related to the angles of triangles. | 13.3.1 | In a right triangle the measure of one of the acute angles is 4 times the measure of the other. Find the measure of the larger angle.<br>a) 72 b) 18 c) 60 d) 30 |
| | | 13.3.2 | The measure of the angles of a triangle are in the ratio 3 to 4 to 5. Find the measure of each angle. |
| *13.4 | Solve problems about perimeters and areas. | 13.4.1 | A rectangle has sides that measure 70 cm and 280 cm. What is the length of the side of the square that has the same area as the rectangle?<br>a) 140 cm b) 120 cm c) 80 cm d) 40 cm |
| | | 13.4.2 | The perimeter of a rectangular field is 1040 yards. The length is 40 yards more than twice the width. Find the dimensions of the field. |

COMPETENCY GOAL 13: The learner will identify geometric figures, parts of figures, and solve problems related to them.

| Objectives | Measures |
|---|---|
| *13.5 Use the similar triangle relationship to solve problems. | 13.5.1 A tree casts a 18-meter shadow at the same time of day that a 3-meter vertical stick casts a 2-meter shadow. How tall is the tree?<br>a) 21m b) 12m c) 24m d) 27m<br>13.5.2 A girl who is 5 feet tall casts a shadow 30 inches long at the same time that a flagpole has a shadow 240 inches long. How tall is the flagpole? |
| *13.6 Use the Pythagorean Theorem and its converse to solve geometric problems. | 13.6.1 The lengths of the legs of a right triangle are 6m and 8m. Find the length of the hypotenuse.<br>a) 16m b) 12m c) 14m d) 10m<br>13.6.2 Is a triangle with sides of lengths 8m, 15m, and 17m a right triangle? |
| *13.7 Find the sine, cosine, and tangent of the acute angles in a right triangle. | State the value of each trigonometric ratio for the triangle shown.<br>13.7.1 sin A<br> <br>a) $\frac{12}{35}$ b) $\frac{35}{37}$ c) $\frac{35}{12}$ d) $\frac{12}{37}$<br>13.7.2 cos A |

COMPETENCY GOAL 13: The learner will identify geometric figures, parts of figures, and solve problems related to them.

| | Objectives | Measures |
|---|---|---|
| *13.8 | Use a table of trigonometric ratios or a calculator to find the values for trigonometric functions for given angles. | Use a table of trigonometric ratios or a calculator to help solve these problems.<br>13.8.1 $\sin 27^\circ$<br>a) 0.8910 b) 0.4540<br>c) 0.5095 d) 0.4695<br>13.8.2 $\tan 71^\circ$ |
| *13.9 | Use a table of trigonometric ratios or a calculator to find the measures of angles for given values of trigonometric functions. | Use a table of trigonometric ratios or a calculator to help solve these problems.<br>13.9.1 If $\cos B = 0.6820$, then $B =$ ________<br>a) $43^\circ$ b) $37^\circ$ c) $53^\circ$ d) $47^\circ$<br>13.4.2 If $\tan A = 0.6249$, then $A =$ _______ |
| *13.10 | Use trigonometric ratios to solve problems. | Use a table of trigonometric ratios or a calculator to help solve these problems.<br>13.10.1 A ramp 4 m long is dropped from the rear of a van to a sidewalk. If the ramp makes an $18^\circ$ angle with the sidewalk, how high is the floor of the van above the sidewalk?<br>a) 1.2m b) 2.1m<br>c) 1.8m d) 2.4m<br>13.10.2 A point on the ground is 300 feet from the base of a tower. The angle of elevation from the point to the top of the tower is $62^\circ$. What is the height of the tower to the nearest foot? |

*"These objectives would be included in an enriched course but not in a basic course."

## Geometry Outline

1. Sets of Points
   - a. Find the measure of an angle using a protractor.
   - b. Identify the bisector of an angle.
   - c. Find the coordinate of a point on a line or coordinates of a point in a plane.
   - d. Find the midpoint of a line segment.
   - e. Identify and name lines, rays, segments, and planes.
2. Real Numbers
   - a. State and use properties of equality and inequality.
3. Geometric Proofs
   - a. Write two-column proofs.
   - b. State the converse, hypothesis, and conclusion of conditional statements.
   - c. Write an indirect proof.
   - d. Use the process of deductive reasoning in mathematical and nonmathematical situations.
4. Angles and Lines
   - a. Identify adjacent and vertical angles.
   - b. Determine the complement and supplement of a given angle.
   - c. Apply angle addition and segment addition postulates.
   - d. Classify angles.
   - e. Recognize congruent angles.
5. Perpendicular Lines and Planes
   - a. Apply definitions of perpendicular lines and planes.
6. Parallel Lines and Planes
   - a. State which angles are congruent when parallel lines are cut by a transversal.
   - b. State which angles are supplementary when parallel lines are cut by a transversal.
7. Polygons
   - a. Classify polygons.
   - b. Find the measures of exterior and interior angles of polygons.
   - c. Complete proofs involving polygons.

8. Triangles

    a. Classify triangles.
    b. Use various postulates and theorems to prove two triangles congruent.
    c. Identify the corresponding parts of congruent triangles.

9. Similarity

    a. Identify similar polygons.
    b. Prove triangles are similar.
    c. Apply properties of similar triangles.

10. Right Triangles

    a. State and apply relationships that exist in right triangles.
    b. Use table and/or calculator to apply definitions of sine, cosine, and tangent.

11. Circles

    a. Apply theorems involving arcs, angles, and chords of a circle.
    b. Apply theorems that related to tangents, secants, and radii of a circle.

12. Perimeter, Area, and Volume

    a. Compute perimeter and area of geometric figures.
    b. Compute lateral area, total area, and volume of pyramids, cylinders, and cones.

13. Geometric Constructions

    a. Complete constructions related to angles and segments.
    b. Construct perpendicular and parallel lines.
    c. Circumscribe and inscribe circles.
    d. Construct quadrilaterals meeting certain criteria.

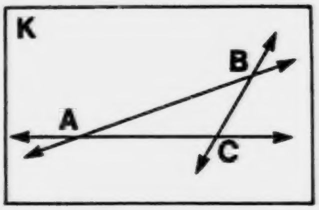
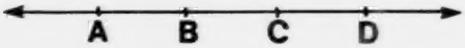
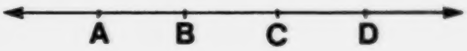
14. Coordinate Geometry

    a. Apply distance and midpoint formulas.
    b. Find slopes and y-intercepts of lines.
    c. Write the equation and draw the graph of a line given two points on the line, one point and the slope, or the slope and y-intercept of the line.

MATHEMATICS

Grade Level: 9-12 Skill/Subject Area: Geometry

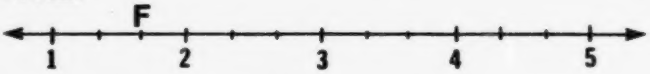
COMPETENCY GOAL 1: The learner will state the characteristics of sets of points.

| Objectives | | Measures | |
|---|---|---|---|
| 1.1 | Identify and name sets of points, such as line, ray, segment, and plane. | 1.1.1 | How many noncollinear points are necessary in order to determine a plane?<br>a) none b) one c) two d) three |
| | | 1.1.2 | Explain the difference between a line and a segment. |
| 1.2 | Draw representations of points, lines, and planes. | 1.2.1 | Given points A,B, and C in plane K. How many lines contain both points A and B?<br> <br>a) none b) one c) two d) three |
| | | 1.2.2 | Draw a representation of two intersecting planes. |
| 1.3 | Identify and name unions and intersections of sets of points. | 1.3.1 | Given:  <br>$\overleftarrow{CA} \cap \overrightarrow{BD} =$<br>a) $\overrightarrow{BC}$ b) $\overline{BC}$ c) $\overrightarrow{CD}$ d) C |
| | | 1.3.2 | Given:  <br>$\overleftarrow{CA} \cup \overrightarrow{BD} =$ |

Objectives | Measures

1.4 Find the coordinate of a point on a line.

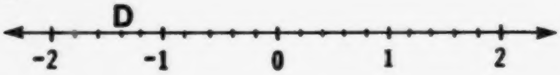
1.4.1 Given:



Name the coordinate of point F.

a) 1 b) $1\frac{1}{3}$ c) $1\frac{1}{2}$ d) $1\frac{2}{3}$

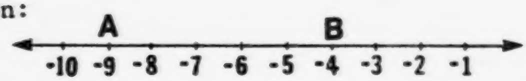
1.4.2 Given:



Name the coordinate of point D.

1.5 Find the length of a segment.

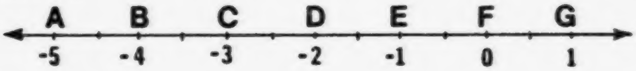
1.5.1 Given:


A
B
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1

Find the length of $\overline{AB}$.

a) -4 b) -5 c) 5 d) 4

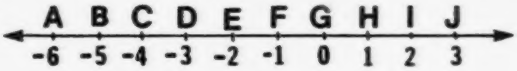
1.5.2 Given:


A
B
C
D
E
F
G
-5
-4
-3
-2
-1
0
1

Name three segments each having a length of 4 units.

1.6 Identify congruent segments.

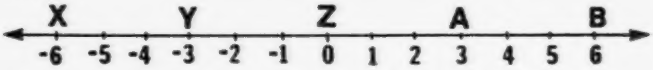
1.6.1 Given:


A
B
C
D
E
F
G
H
I
J
-6
-5
-4
-3
-2
-1
0
1
2
3

Find a segment congruent to $\overline{BE}$.

a) $\overline{CG}$ b) $\overline{AD}$ c) $\overline{BF}$ d) $\overline{CH}$

1.6.2 Given:

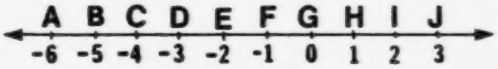

X
Y
Z
A
B
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6

List two congruent segments.

Objectives | Measures

1.7 Identify the midpoint of a given segment.

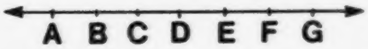
1.7.1 Given:



Find the midpoint of $\overline{CG}$.

a) D b) E c) F d) None of these

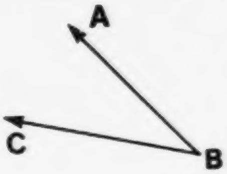
1.7.2 Given:



Name a segment which has point D as its midpoint.

1.8 Use a protractor to find the measure of an angle.

1.8.1 Find the measure of angle ABC.

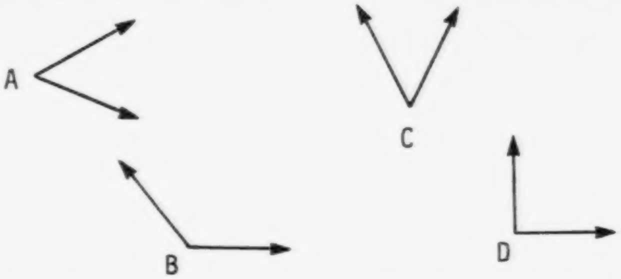


a) 35 b) 40 c) 50 d) 25

1.8.2 Draw an angle having a measure of 105.

1.9 Determine when two angles are congruent.

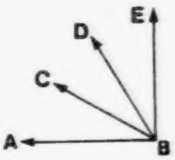
1.9.1 Using a protractor, find two congruent angles.



a) angles A and B b) angles A and D

c) angles C and A d) none of these

1.9.2 Given that angles ABC, CBD and DBE are congruent, name two other angles that are also congruent.

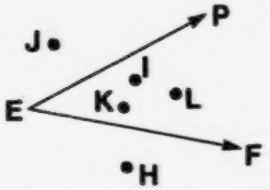


COMPETENCY GOAL 1: The learner will state the characteristics of sets of points.

| Objectives | Measures |
|---|---|

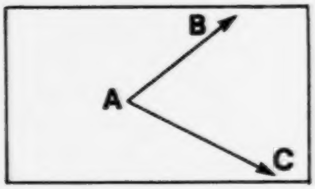
**1.10 Identify interiors and exteriors of geometric figures.**

1.10.1 Given angle PEF, list all points in the exterior of the angle.



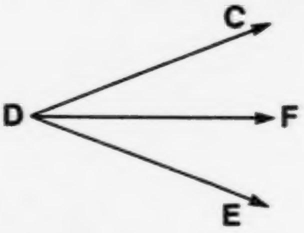
a) K and J
b) H and J
c) L,H,J,I
d) G and K

1.10.2 Given ∠BAC, shade its interior.



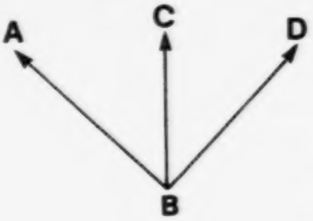
**1.11 Identify the bisector of an angle.**

1.11.1 If $\overrightarrow{DF}$ is a bisector of ∠CDE, then:



a) $\angle FDE = \frac{1}{2} \angle CDE$
b) $\angle CDF = \frac{1}{2} \angle FDC$
c) $\angle EDC = \frac{1}{2} \angle CDF$
d) None of these

1.11.2 If $\overrightarrow{BC}$ bisects ∠ABD then m ∠CBD = m ∠_____



## MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 2: The learner will use the structural properties of the real number.

| Objectives | Measures |
|---|---|
| 2.1 State and use the properties of equality. | 2.1.1 Which of the statements below illustrate the symmetric property of equality?<br>a) If $x+y = z$ and $z = q+a$ then $x+y = q+a$<br>b) If $a+b = c$ then $c = a+b$<br>c) If $xy = z$ then $zya = za$<br>d) $a+y = a+y$<br>2.1.2 Give an example illustrating the transitive property of equality. |
| 2.2 State and use the properties of inequality. | 2.2.1 Which of the statements below illustrates the subtraction property of inequality?<br>a) $a-b < a-b$<br>b) If $x > y$ and $c < 0$ then $xc < yc$<br>c) If $a < b$ then $a-c < b-c$<br>d) If $a-b < c$ and $c < d$ then $a-b < d$<br>2.2.2 Give an example illustrating the addition property of inequality. |

## MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 3: The learner will develop geometric proofs.

| Objectives | Measures |
|---|---|
| **3.1 Translate a geometric statement into an "If-Then Statement".** | 3.1.1 Rewrite the statement below in an "if . . . then" form: "All squares are rectangles".<br>a) If a figure is a square, then it is a rectangle.<br>b) If a figure is a rectangle, then it is a square.<br>c) If a figure is a rectangle, then it is not a square.<br>d) If a figure is not a square, then it is not a rectangle. |
| | 3.1.2 Rewrite the following statement in an "if . . . then" form: "Segments whose lengths are unequal are not congruent." |
| 3.2 State the converse of a conditional statement. | 3.2.1 Given the statement: "If three lines have a point in common, then they are coplanar." Identify the converse.<br>a) If three lines are not coplanar, then they do not have a point in common.<br>b) If three lines are not coplanar, then they have a point in common.<br>c) If three lines are coplanar, then they have a point in common.<br>d) If three lines are coplanar, then they do not have a point in common. |
| | 3.2.2 Write the converse of: "If a figure is a rectangle, then it has four right angles." |

COMPETENCY GOAL 3: The learner will develop geometric proofs.

| Objectives | Measures |
|---|---|

3.3 State the hypothesis and conclusion for a conditional statement.

3.3.1 Given the statement: "If it is raining, then I will stay inside." Identify the hypothesis.

a) I will stay inside.

b) I will not stay inside.

c) It is raining.

d) None of these

3.3.2 What is the conclusion of the statement: "If two points lie on the same line then they are collinear".

3.4 Use the process of deductive reasoning in mathematical and non-mathematical situations.

3.4.1 Using deductive reasoning, complete the following:

1. All math teachers are smurfs.
2. I am a math teacher.

a) I am a smurf.

b) I am not a smurf.

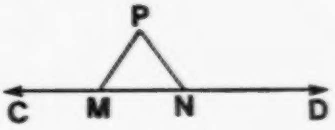
c) I am not a teacher.

d) I am not a math teacher.

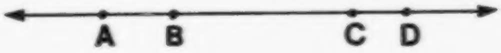
3.4.2 Using two true statements and a conclusion, write an example illustrating deductive reasoning.

3.5 Write a proof using the two-column format.

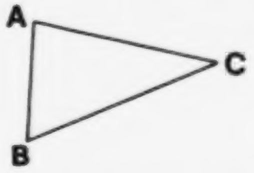
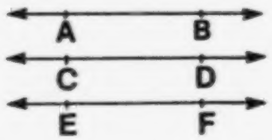
3.5.1 Given: The figure with $\angle PMN \cong \angle PNM$
Prove: $\angle CMP \cong \angle DNP$



3.5.2 Given: AB=CD
Prove: AC=BD



COMPETENCY GOAL 3: The learner will develop geometric proofs.

| Objectives | Measures |
|---|---|
| 3.6 Write an indirect proof. | 3.6.1 Write an indirect proof to show a triangle cannot have two right angles.<br>Given: $\triangle ABC$<br>Prove: Angles A and B cannot both be right angles.<br><br> |
| | 3.6.2 Write an indirect proof to show that two lines parallel to the same line are parallel to each other.<br><br> |

MATHEMATICS

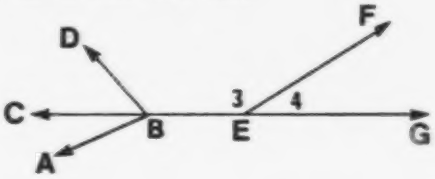
Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 4: The learner will use some of the properties of angles and lines to develop proofs and solve exercises.

| Objectives | Measures |
|---|---|

4.1 Use three letters, a number, or a single letter to name an angle.

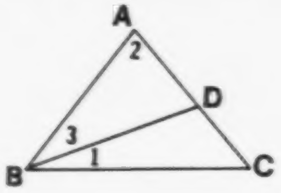
4.1.1 Another name for ∠4 is:



a) ∠GFE b) ∠E

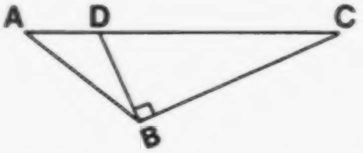
c) ∠FEB d) ∠FEG

4.1.2 Using three letters name ∠3.



4.2 Classify an angle.

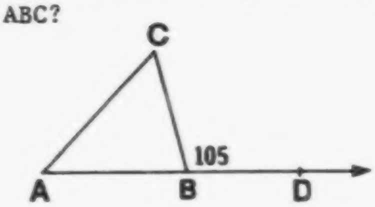
4.2.1 Given $\overline{DB} \perp \overline{BC}$, classify ∠ABC.



a) acute b) right

c) obtuse d) straight

4.2.2 Given m ∠CBD = 105, what type of angle is ∠ABC?

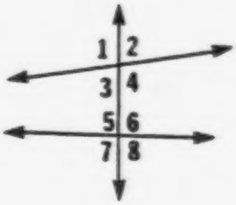


COMPETENCY GOAL 4: The learner will use some of the properties of angles and lines to develop proofs and solve exercises.

Objectives — Measures

4.3 Identify adjacent and vertical angles.

4.3.1 Choose the correct name for angles 1 and 4.



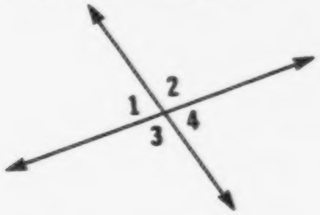
a) exterior angles

b) interior angles

c) corresponding angles

d) vertical angles

4.3.2 Name two adjacent angles.



4.4 Determine the complement and supplement of a given angle.

4.4.1 If m ∠A = 37 and m ∠B = 53, then they are:

a) complementary angles

b) supplementary angles

c) vertical angles

d) interior angles

4.4.2 Find the supplement of ∠A if m ∠A = 72.

4.5 Apply the Angle Addition Postulate.

4.5.1 If C lies in the interior of ∠ABG then m ∠ABG is equal to:

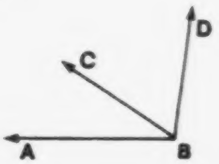
a) m ∠ABC - m ∠CBG

b) m ∠ABC + m ∠CBG

c) m ∠AGB + m ∠CBG

d) m ∠CBG - m ∠ABC

4.5.2 Apply the Angle Addition Postulate to the illustration.

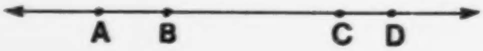


COMPETENCY GOAL 4: The learner will use some of the properties of angles and lines to develop proofs and solve exercises.

| Objectives | Measures |
|---|---|

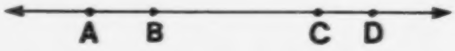
**4.6 Apply the Segment Addition Postulate. (Definition of Betweenness)**

4.6.1 If AB = 7, BC = 10 and CD = AB find BD.



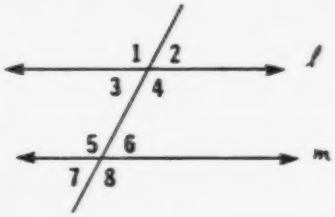
a) 24 b) 14 c) 17 d) 27

4.6.2 If AB = 5, BC = 8, and CD = AB, find BD

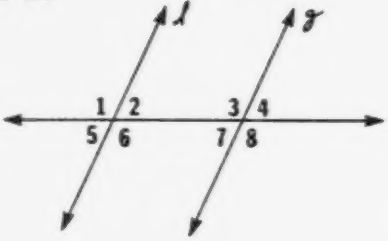


4.7 Recognize congruent angles.

4.7.1 Given $\ell \parallel m$. List two congruent angles.



4.7.2 Given $\ell \parallel g$. List all angles congruent to angle 2.



MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 5: The learner will recognize perpendicular lines and planes and use this information to complete proofs and exercises.

| Objectives | Measures |
|---|---|
| 5.1 Apply definitions of perpendicular lines and planes. | 5.1.1 Complete: A line perpendicular to a plane is a line which is perpendicular to _______ line(s) in the plane which intersect it.<br>a) no b) exactly one<br>b) exactly two d) all |
| | 5.1.2 If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$ at X, how many right angles are formed? |

## MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 6: The learner will recognize parallel lines and planes and use this knowledge to complete proofs and exercises.

| Objectives | Measures |
|---|---|

**6.1 Identify parallel lines and planes, and skew lines.**

6.1.1 Coplanar lines which do not intersect are:

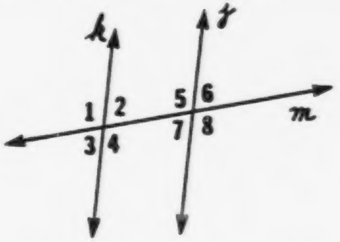
a) skew lines b) parallel lines

c) acute lines d) obtuse lines

6.1.2 Noncoplanar lines are called ____________ lines.

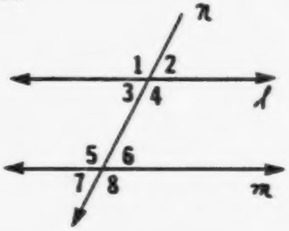
**6.2 Identify corresponding angles and alternate interior angles which are formed when two parallel lines are cut by a transversal.**

6.2.1 Given $k \parallel j$. Find the corresponding angle to $\angle 2$.



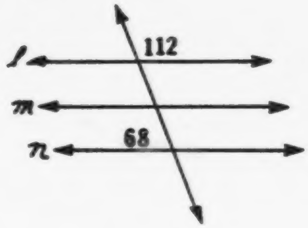
a) 1 b) 3 c) 5 d) 6

6.2.2 Given $\ell \parallel m$. Identify two pairs of alternate interior angles.



**6.3 State conditions under which lines are parallel.**

6.3.1 Which lines must be parallel?



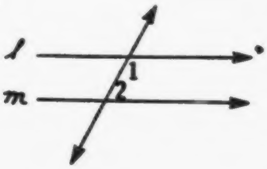
a) ℓ and m

b) ℓ and n

c) m and n

d) ℓ, m, and n

6.3.2 Given $m\angle 1 + m\angle 2 = 180$, what conclusions can we draw regarding ℓ and m?

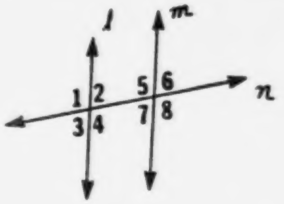


COMPETENCY GOAL 6: The learner will recognize parallel lines and planes and use this knowledge to complete proofs and exercises.

| Objectives | Measures |
|---|---|

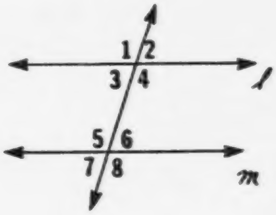
**6.4 State which angles are congruent when two parallel lines are cut by a transversal.**

6.4.1 Given $\ell \parallel m$. Which of the angles is congruent to $\angle 5$?



a) 2 b) 3 c) 7 d) None of these

6.4.2 Given $\ell \parallel m$. Which angles are congruent to angle 1?



**6.5 Identify which angles are supplementary when lines are cut by a transversal.**

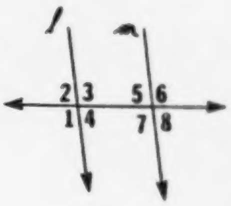
6.5.1 Given $\ell \parallel m$ and the measure of angle 2 = 77. The angles which are supplementary to angle 2 are:

a) angles 7,8,5,3

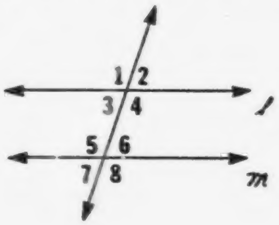
b) angles 7,3,1,6

c) angles 5,8,4

d) angles 1,5,6,4



6.5.2 Given $\ell \parallel m$. What angles are supplementary to angle 3?



## MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 7: The learner will identify polygons and complete proofs and exercises related to them.

| Objectives | Measures |
|---|---|
| 7.1 Classify a triangle according to its sides. | 7.1.1 A triangle having no congruent sides is:<br>a) scalene b) equilateral<br>c) isosceles d) right |
| | 7.1.2 At least how many sides are congruent in an isosceles triangle? |
| 7.2 Classify a triangle according to its angles. | 7.2.1 A triangle having three angles with the same measure is:<br>a) right b) obtuse<br>c) equiangular d) scalene |
| | 7.2.2 How many obtuse angles does an obtuse triangle have? |
| 7.3 Classify a polygon according to the number of its sides or angles. | 7.3.1 An eight-sided polygon is a(n):<br>a) pentagon b) hexagon<br>c) octagon d) decagon |
| | 7.3.2 A polygon having ten vertices is called a ______________________________. |
| 7.4 Classify a convex polygon according to the measure of its angles. | 7.4.1 A convex polygon the sum of whose interior angles measure 720 is a(n):<br>a) pentagon b) hexagon<br>c) octagon d) decagon |
| | 7.4.2 The measure of an angle of a regular convex polygon with n sides is____________. |

COMPETENCY GOAL 7: The learner will identify polygons and complete proofs and exercises related to them.

| Objectives | Measures |
|---|---|

**7.5 Apply the fact that the sum of the measures of the angles of a triangle is 180.**

7.5.1 Given Δ ABC. Find the measure of ∠A if
$m\angle A = x + 10$
$m\angle B = x + 20$
$m\angle C = x + 30$

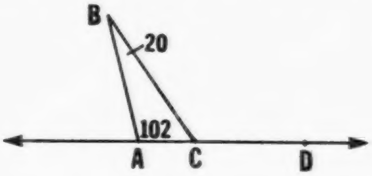
a) 40 b) 60

c) 70 d) 80

7.5.2 Given Δ ABC with $m\angle A = 74$, $m\angle B = 47$. Find $m\angle C$.

**7.6 Find the measures of the exterior angles of a triangle.**

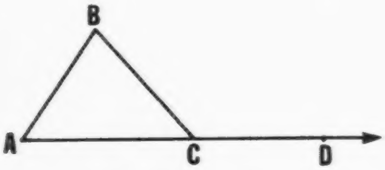
7.6.1 Given $m\angle B = 20$, $m\angle A = 102$, find $m\angle BCD$.



a) 82 b) 20

c) 102 d) 122

7.6.2 Given the $m\angle B = 62$ and $m\angle BCD = 138$, find $m\angle A$.



**7.7 Find the measures of the interior and exterior angles of a convex polygon.**

7.7.1 The sum of the measures of the interior angles of a convex polygon having 11 sides is:

a) 1980 b) 360

c) 1100 d) 1620

7.7.2 What is the sum of the measures of the exterior angles of a convex decagon?

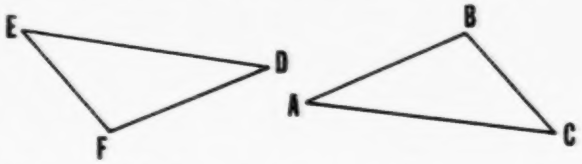
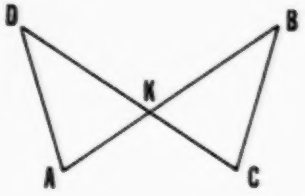
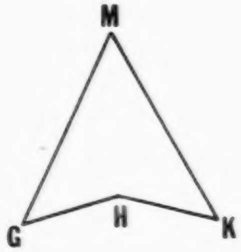
COMPETENCY GOAL 7: The learner will identify polygons and complete proofs and exercises to them.

| Objectives | Measures |
|---|---|
| 7.8 Apply the characteristics of various quadrilaterals. | 7.8.1 One difference between a rhombus and a square is:<br>a) A square has four congruent sides, a rhombus does not necessarily.<br>b) A square has four right angles, a rhombus does not necessarily.<br>c) A rhombus has congruent sides and congruent angles, a square does not.<br>d) Both a and b.<br>7.8.2 Given that a quadrilateral has four right angles and diagonals of equal length, the quadrilateral must be a(n)_______________. |

MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 8: The learner will identify congruent triangles and complete proofs and exercises related to them.

| Objectives | Measures |
|---|---|
| 8.1 List the corresponding parts of two congruent triangles. | 8.1.1 If $\triangle ABC \cong \triangle EFD$, $\overline{AC}$ is congruent to:<br>a) $\overline{BC}$ b) $\overline{EF}$ c) $\overline{DG}$ d) $\overline{ED}$<br>8.1.2 If $\triangle ABC \cong \triangle DEF$, then $\angle A \cong \angle$ ?.<br> <br>a) D b) F c) E d) C |
| 8.2 Use various postulates and theorems to prove two triangles are congruent and their corresponding parts are congruent. | 8.2.1 Given the figure with AD = CB and AB = CD. If we introduce line AC, how can we prove $\triangle BAC \cong \triangle DCA$?<br>a) ASA<br>b) HL<br>c) SAS<br>d) SSS<br> <br>8.2.2 Given the figure with MK = MG, HK = HG. Prove that $\angle G \cong \angle K$.<br> |

COMPETENCY GOAL 8: The learner will identify congruent triangles and complete proofs and exercises related to them.

| Objectives | Measures |
|---|---|

**8.3 Identify the altitudes and medians of triangles.**

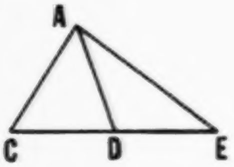
8.3.1 If CD = DE then AD is a ____________ of Δ ACE.

a) centroid

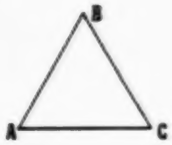
b) median

c) altitude

d) hypotenuse



8.3.2 Draw an altitude of Δ ABC and explain its relationship to the side of Δ ABC it touches.

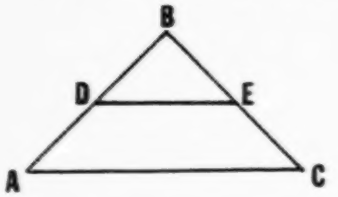


**8.4 Apply the theorem about the segment joining the midpoints of two sides of a triangle.**

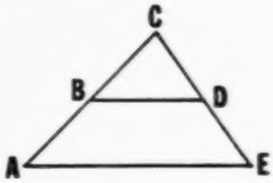
8.4.1 Given: Point D is the midpoint of $\overline{AB}$ and point E is the midpoint of $\overline{BC}$. Find AC if DE = 14.

a) 7 c) 20

b) 10 d) 28



8.4.2 Given that AB = BC and CD = DE what can we conclude about $\overline{BD}$?

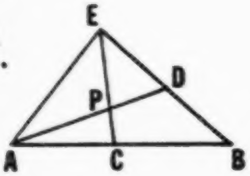


**8.5 Apply the theorem about the intersection of the medians of a triangle.**

8.5.1 The medians of a triangle are concurrent at a point which is what fractional distance from each vertex to the midpoint of the opposite side?

a) $1\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{2}{3}$ d) $\frac{3}{4}$

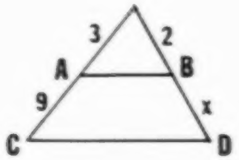
8.5.2 Given ΔABE with $\overline{AD}$ the median to $\overline{BE}$ and $\overline{EC}$ the median to $\overline{AB}$. If EC = 12, then EP = ?



MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 9: The learner will demonstrate when two polygons are similar and develop proofs and solve exercises related to them.

| Objectives | Measures |
|---|---|
| **9.1 Identify regular polygons and determine the measures of the angles.** | 9.1.1 Which of the following is always a regular polygon?<br>a) square b) rectangle<br>c) rhombus d) both (b) and (c)<br>9.1.2 Find the measure of each interior angle of a regular hexagon. |
| 9.2 Solve a proportion. | 9.2.1 Solve the following proportion:<br>$\frac{2}{x} = \frac{5}{8}$<br>a) $x = 2\frac{1}{4}$ b) $x = 3\frac{1}{5}$<br>c) $x = \frac{5}{16}$ d) $x = \frac{5}{4}$<br>9.2.2 Using only numbers write an example of a true proportion. |
| 9.3 Use proportions to solve geometric problems. | 9.3.1 If $\overline{AB} \parallel \overline{CD}$ find x:<br><br> <br>a) x = 8<br>b) x = 10<br>c) x = 6<br>d) x = 4<br>9.3.2 Given the figure in 9.3.1, find x if AC = 14. |
| 9.4 Find the geometric mean of two numbers. | 9.4.1 Find the geometric mean of 2 and 8.<br>a) 4 b) -4 c) 6 d) -6<br>9.4.2 Find the geometric mean of 1 and 7. |

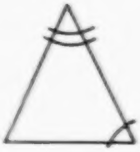
**COMPETENCY GOAL 9:** The learner will demonstrate when two polygons are similar and develop proofs and solve exercises related to them.

**Objectives** | **Measures**

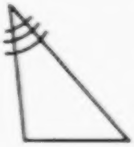
**9.5 Determine whether or not two polygons are similar.**

9.5.1 Which of the triangles below are similar?

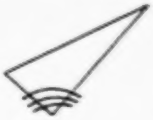
a)



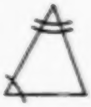
b)



c)



d)



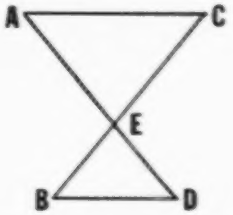
a) a and b b) b and c

c) c and d d) a and d

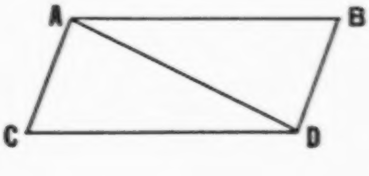
9.5.2 Which describes similar polygons--same size, same shape, or same size and shape?

**9.6 Prove two triangles are similar.**

9.6.1 If $\overline{AC} \parallel \overline{BD}$ prove $\triangle AEC \sim \triangle DEB$.



9.6.2 Given a parallelogram ABDC.
Prove: $\triangle DAB \cong \triangle ADC$

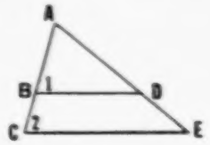


**COMPETENCY GOAL 9:** The learner will demonstrate when two polygons are similar and develop proofs and solve exercises related to them.

| Objectives | Measures |
|---|---|

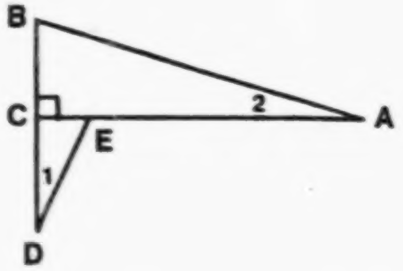
**9.7 Apply properties of similar triangles to find corresponding proportional sides.**

9.7.1 Given: m $\angle 1 = \angle 2$, AB=4, BD=5, and CE=8. Find AC.



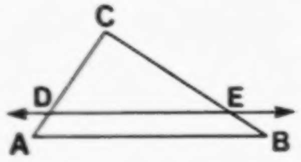
a) $10\frac{2}{5}$  b) $\frac{5}{32}$  c) $6\frac{2}{5}$  d) 22

9.7.2 Given: $\overline{AC} \perp \overline{BD}$ and m $\angle 1$ = m $\angle 2$, then $\frac{AB}{ED} = \frac{AC}{?}$



**9.8 Apply theorems which involve dividing segments proportionally.**

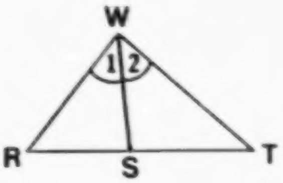
9.8.1 If $\overleftrightarrow{DE} \parallel \overline{AB}$, which of the following is incorrect?



a) $\frac{CD}{DA} = \frac{CE}{EB}$  b) $\frac{CD}{DA} = \frac{DE}{AB}$

c) $\frac{CD}{CB} = \frac{DE}{AB}$  d) none of these

9.8.2 If angle 1 is congruent to angle 2, complete the proportion below:



$\frac{RS}{ST} = \underline{\ ?\ }$

MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 10: The learner will state some of the characteristics of a right triangle and solve exercises related to them.

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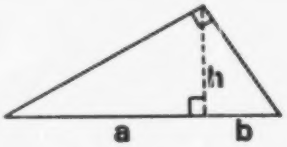
Objectives | Measures

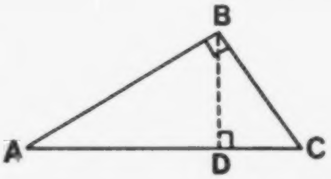
**10.1 State two relationships that exist in a right triangle.**

10.1.1



In the figure on the left write a true proportion using h, a, b.

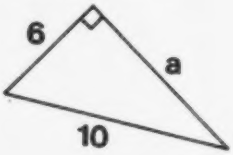
10.1.2 Identify all similar triangles.



**10.2 Use the Pythagorean Theorem and its converse to find the lengths of the sides of a right triangle or a quadrilateral.**

10.2.1 Given the triangle below, find a.

a) 9
b) 8
c) 12
d) None of these



10.2.2 Find the length of a rectangle having a width of 5 and a diagonal of 13.

**10.3 Use the relationships that exist in special right triangles to solve problems.**

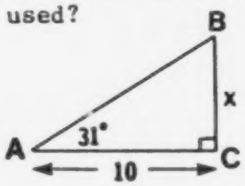
10.3.1 $\Delta ABC$ is a $30^\circ - 60^\circ$ right triangle. If the side opposite the $30^\circ$ angle is 20, find the length of the side opposite the $60^\circ$ angle.

a) 40
b) $40\sqrt{2}$
c) $20\sqrt{3}$
d) $15\sqrt{2}$

10.3.2 $\Delta ABC$ is a $45^\circ - 45^\circ$ right triangle. The length of the hypotenuse is 10. Find the length of a leg.

COMPETENCY GOAL 10: The learner will state some of the characteristics of a right triangle and solve exercises related to them.

| Objectives | Measures |
|---|---|
| 10.4 Using a table and/or calculator, apply the definitions of sine, cosine, and tangent to solve right triangles. | 10.4.1 To solve for x, in ΔABC below, which equation should be used? |



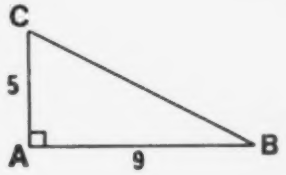
a) $\sin 31^{\circ} = \frac{x}{10}$

b) $\cos 31^{\circ} = \frac{10}{x}$

c) $\tan 31^{\circ} = \frac{x}{10}$

d) $\sin 31^{\circ} = \frac{10}{x}$

10.4.2 Given Δ ABC, find the measure of angle C.



MATHEMATICS

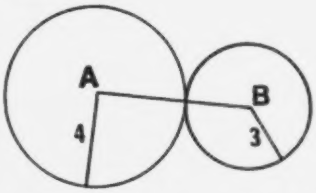
Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 11: The learner will list some characteristics of a circle and develop proofs and solve exercises related to them.

Objectives | Measures

11.1 Use the definitions of a circle and the lines and segments related to it.

11.1.1 Given: Circles A and B are tangent. The length of $\overline{AB}$ is.



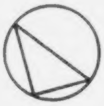
a) 5 b) 14 c) 7 d) 12

11.1.2 Draw two circles that have four common external tangents.

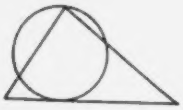
11.2 Recognize polygons inscribed in or circumscribed about a circle.

11.2.1 The illustration with the triangle inscribed in the circle is:

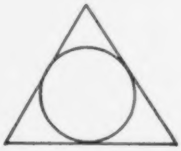
(a)



(b)



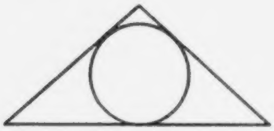
(c)



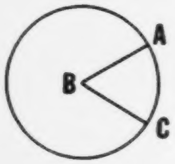
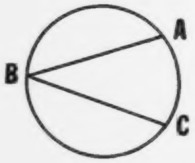
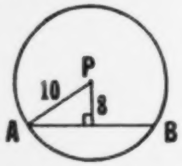
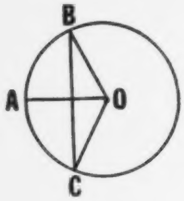
a) (a) b) (b)

c) (c) d) both (a) and (b)

11.2.2 What can be said about the triangle in the figure below?



COMPETENCY GOAL 11: The learner will list some characteristics of a circle and develop proofs and solve exercises related to them.

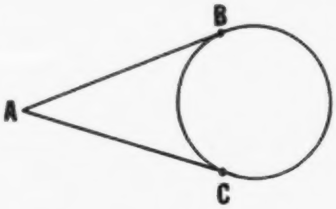
| Objectives | Measures |
|---|---|
| 11.3 Apply the properties involving arcs and angles of circles. | 11.3.1 Find the measure of arc AC if m $\angle ABC = 60$.<br><br> <br>a) 120 b) 60 c) 70 d) 30 |
| | 11.3.2 If m $\angle ABC = 47$, find the measure of arc AC.<br><br> |
| 11.4 Apply the theorems about the chords of a circle. | 11.4.1 The length of $\overline{AB}$ is:<br><br> <br>a) 8<br>b) 16<br>c) 6<br>d) 12 |
| | 11.4.2 Given the radius $\overline{OA} \perp \overline{BC}$. What conclusions, if any, can be drawn regarding arcs AB and AC?<br><br> |

COMPETENCY GOAL 11: The learner will list some characteristics of a circle and develop proofs and solve exercises related to them.

| Objectives | Measures |
|---|---|

11.5 Apply the theorems that relate to the tangents, secants, and radii of a circle.

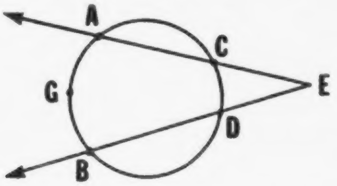
11.5.1



Given tangent segments $\overline{AB}$ and $\overline{AC}$. If AB = 6, what can be concluded about AC?

a) cannot determine length of $\overline{AC}$
b) AC = 3
c) AC = 6
d) AC = $3\sqrt{2}$

11.5.2 Given $m\angle AEB = 30$ and the measure of arc AGB is 80, find the measure of arc CD.



a) 10 b) 20 c) 25 d) 40

MATHEMATICS

Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 12: The learner will find the perimeter, area, and volume of geometric figures.

| Objectives | Measures |
|---|---|

12.1 Find the perimeter of a geometric figure.

12.1.1 Find the perimeter of a regular hexagon having a side of length 3.1 meters.

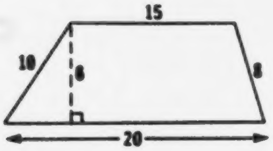
a) 6.2 meters b) 18.6 meters

c) 9.3 meters d) 15.5 meters

12.1.2 Given parallelogram ABCD. AB = 15 and BC = 30. Find the perimeter.

12.2 Compute the area of a triangle, parallelogram, trapezoid, and rectangle.

12.2.1 Find the area of the trapezoid below.



a) 210 sq. units
b) 175 sq. units
c) 90 sq. units
d) 105 sq. units

12.2.2 Find the area of a right triangle whose legs are 5 meters and 7 meters long.

12.3 Find the ratio of both the areas and the perimeters of similar triangles.

12.3.1 If the ratio of the lengths of corresponding sides of two similar triangles is $\frac{5}{6}$, find the ratio of their areas.

a) $\frac{10}{6}$ b) $\frac{25}{6}$ c) $\frac{25}{36}$ d) $\frac{5}{6}$

12.3.2 The ratio of the lengths of corresponding sides of similar triangles is $\frac{3}{5}$. If the perimeter of the larger triangle is 15, find the perimeter of the smaller triangle.

12.4 Compute the apothem, radius, and area of special regular polygons.

12.4.1 Find the area of a regular octagon if the length of each side is 2 m and the apothem is 2.1 m.

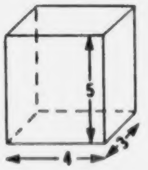
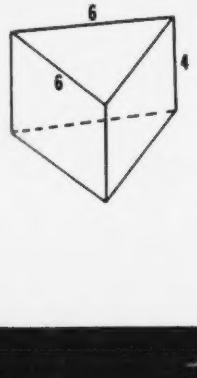
a) 2.1 $m^2$ b) 4.2 $m^2$

c) 8.4 $m^2$ d) 16.8 $m^2$

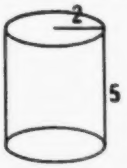
12.4.2 Find the radius of a regular hexagon having an apothem of $4\sqrt{3}$ and a side of 8.

Skills/Subject Area: Geometry

COMPETENCY GOAL 12: The learner will find the perimeter, area, and volume of geometric figures.

| Objectives | Measures |
|---|---|
| 12.5 Compute the circumference and area of a circle. | 12.5.1 Given a circle having a diameter of 2 units, find the circumference. (Let $\pi = 3.14$)<br>a) 3.14 units b) 3.14 square units<br>c) 6.28 units d) 6.28 square units<br>15.5.2 Given a circle having a diameter of 2 units, find the area. (Let $\pi = 3.14$) |
| 12.6 Compute arc lengths and the areas of sectors of a circle. | 12.6.1 Find the arc length of the sector with a radius of 4 units and an arc measure of 36.<br>a) $\frac{8}{5}\pi$ b) $\frac{4}{5}\pi$<br>c) $\frac{2}{5}\pi$ d) None of these<br>12.6.2 Find the area of a sector of a circle having a 10 m radius and an arc measure of 45. |
| 12.7 Identify and describe space figures. | 12.7.1 How many faces does a triangular prism have?<br>a) three b) four c) five d) six<br>12.7.2 Give a "real life" example of a cylinder. |
| 12.8 Compute the lateral area, total area, and volume of a right prism or pyramid. | 12.8.1 Find the lateral area of the right prism.<br> <br>a) 94 b) 70<br>c) 35 d) 60<br>12.8.2 Find the total area of a right triangular prism whose altitude is 4 and whose bases are equilateral triangles with sides measuring 6.<br> |

COMPETENCY GOAL 12: The learner will find the perimeter, area, and volume of geometric figures.

| Objectives | Measures |
|---|---|
| **12.9 Compute the lateral area, and volume of a right circular cylinder or cone.** | 12.9.1 Find the volume of the cylinder below.<br><br> <br>a) 45 cu. units<br>b) 10 cu. units<br>c) 30 cu. units<br>d) None of these |
| | 12.9.2 Find the lateral area of the cylinder in 12.9.1 above. |

MATHEMATICS

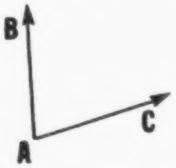
Grade Level: 9-12 Skills/Subject Area: Geometry

COMPETENCY GOAL 13: The learner will complete a geometric construction and describe the locus of a point or points.

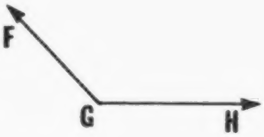
| Objectives | Measures |
|---|---|
| 13.1 Construct a segment congruent to a given segment. | 13.1.1 Given a segment, $\overline{AB}$. Using a compass and straightedge, construct CD congruent to $\overline{AB}$. |

| Objectives | Measures |
|---|---|
|  | 13.1.2 Given $\overline{GH}$. Using a compass and a straightedge, construct JK congruent to $\overline{GH}$. |

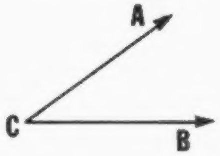
| Objectives | Measures |
|---|---|
| 13.2 Construct an angle congruent to a given angle. | 13.2.1 Given angle BAC, construct ∠FDE congruent to ∠BAC. |



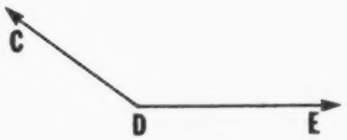
| Objectives | Measures |
|---|---|
|  | 13.2.2 Given angle FGH, construct ∠KLM congruent to ∠FGH. |



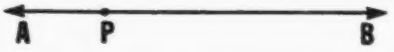
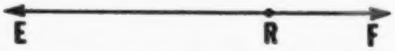
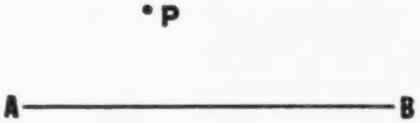
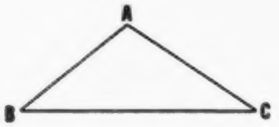
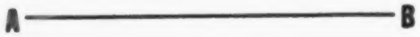
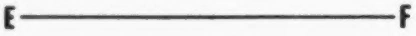
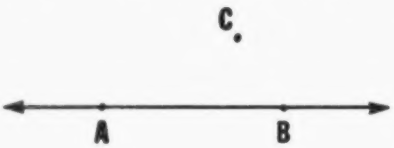
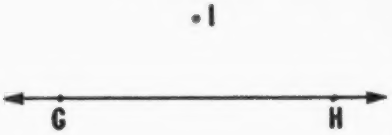
| Objectives | Measures |
|---|---|
| 13.3 Construct the bisector of an angle. | 13.3.1 Given angle ACB, construct the bisector of the angle. |



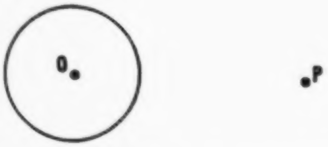
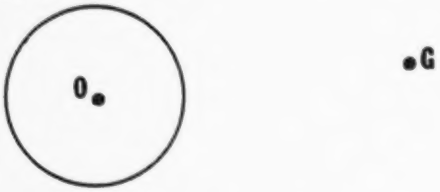
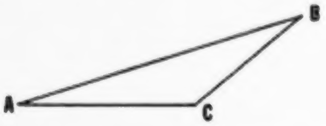
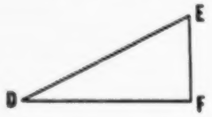
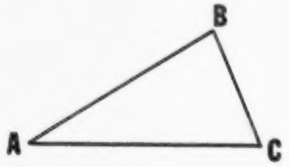
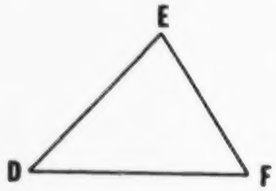
| Objectives | Measures |
|---|---|
|  | 13.3.2 Given the angle CDE, construct the bisector of the angle. |



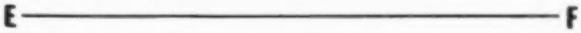
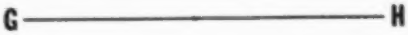
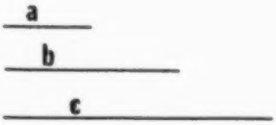
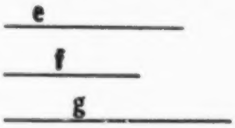
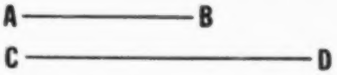
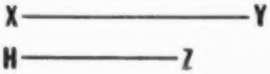
COMPETENCY GOAL 13: The learner will complete a geometric construction and describe the locus of a point or points.

| Objectives | Measures |
|---|---|
| 13.4 Construct a line perpendicular to a line through a point on the line. | 13.4.1 Given $\overleftrightarrow{AB}$ with point P on it, construct $\overleftrightarrow{GP} \perp \overleftrightarrow{AB}$.  |
| | 13.4.2 Given $\overleftrightarrow{EF}$ with point R on it, construct $\overleftrightarrow{AR} \perp \overleftrightarrow{EF}$.  |
| 13.5 Construct a line perpendicular to a line through a point not on the line. | 13.5.1 Given $\overline{AB}$ with point P not on it, construct a line through P perpendicular to $\overline{AB}$.  |
| | 13.5.2 Given $\triangle ABC$, construct the altitude to side BC.  |
| 13.6 Construct the perpendicular bisector of a segment. | 13.6.1 Given $\overline{AB}$, construct the perpendicular bisector of it.  |
| | 13.6.2 Given $\overline{EF}$, construct the perpendicular bisector of it.  |
| 13.7 Construct a line parallel to a line through a given point. | 13.7.1 Given $\overleftrightarrow{AB}$ and point C not on it, construct $\overleftrightarrow{CD} \parallel \overleftrightarrow{AB}$.  |
| | 13.7.2 Given $\overleftrightarrow{GH}$ and point I not on it, construct $\overleftrightarrow{IJ} \parallel \overleftrightarrow{GH}$.  |

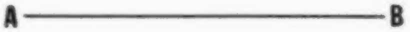
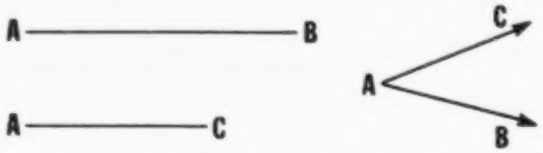
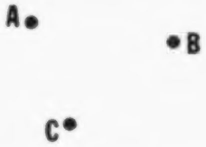
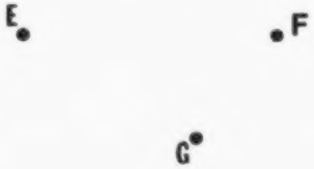
**COMPETENCY GOAL 13:** The learner will complete a geometric construction and describe the locus of a point or points.

| | Objectives | | Measures |
|---|---|---|---|
| 13.8 | Construct the tangents to a circle from a point outside the circle. | 13.8.1 | Given circle O and point P outside the circle, construct two tangents to circle O from point P.  |
| | | 13.8.2 | Given circle O and point G outside the circle, construct two tangents to circle O from point G.  |
| 13.9 | Circumscribe a circle about a triangle. | 13.9.1 | Given ΔABC, circumscribe a circle about it.  |
| | | 13.9.2 | Given ΔDEF, circumscribe a circle about it.  |
| 13.10 | Inscribe a circle inside a triangle. | 13.10.1 | Given ΔABC, inscribe a circle in ΔABC.  |
| | | 13.10.2 | Given ΔDEF, inscribe a circle in ΔDEF.  |

COMPETENCY GOAL 13: The learner will complete a geometric construction and describe the locus of a point or points.

| Objectives | | Measures | |
|---|---|---|---|
| 13.11 | Divide a segment into a given number of congruent segments. | 13.11.1 | Given $\overline{EF}$. Using a compass only, divide $\overline{EF}$ into five congruent segments.  |
| | | 13.11.2 | Given $\overline{GH}$. Using a compass only, divide $\overline{GH}$ into three congruent segments.  |
| 13.12 | Given three segments, construct a fourth segment such that the lengths of the four segments are proportional. | 13.12.1 | Given segments of lengths a,b, and c, construct a segment of length t such that $\frac{a}{b} = \frac{c}{t}$.  |
| | | 13.12.2 | Given segments of lengths e,f, and g, construct a segment of length k such that $\frac{e}{f} = \frac{g}{k}$.  |
| 13.13 | Construct a segment whose length is the geometric mean between the lengths of two given segments. | 13.13.1 | Given $\overline{AB}$ and $\overline{CD}$. Construct a segment $\overline{EF}$ such that the length of EF is the geometric mean of the lengths of $\overline{AB}$ and CD.  |
| | | 13.13.2 | Given $\overline{XY}$ and $\overline{HZ}$. Construct a segment EJ which is the geometric mean of the lengths of $\overline{XY}$ and HZ.  |

COMPETENCY GOAL 13: The learner will complete a geometric construction and describe the locus of a point or points.

| Objectives | Measures |
|---|---|
| 13.14 Construct quadrilaterals which meet certain criteria. | 13.14.1 Construct a square having a side of length AB.<br><br> <br>13.14.2 Construct a parallelogram given sides $\overline{AB}$ and $\overline{AC}$ and ∠CAB.<br><br> |
| 13.15 Construct a circle through three non-collinear points. | 13.15.1 Given points A, B, C, construct a circle through these points.<br><br> <br>13.15.2 Given points E, F, G, construct a circle through these points.<br><br> |

# MATHEMATICS

Grade Level: 9-12

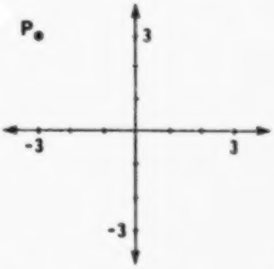
Skills/Subject Area: Geometry

COMPETENCY GOAL 14: The learner will investigate some of the properties of coordinate geometry.

| Objectives | Measures |
|---|---|

14.1 Write the coordinates for a point in the coordinate plane.

14.1.1 Find the coordinates of point P.



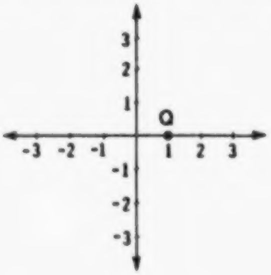
a) (3,3)

b) (-3,3)

c) (3,-3)

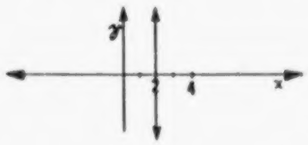
d) (-3,-3)

14.1.2 Find the coordinates of point Q.



14.2 Write equations for vertical and horizontal lines in the coordinate plane.

14.2.1 Write the equation for the vertical line.



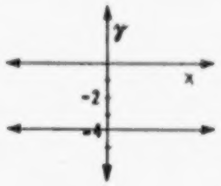
a) x = 2

b) x = -2

c) y = 2

d) y = -2

14.2.2 Write the equation for the horizontal line.

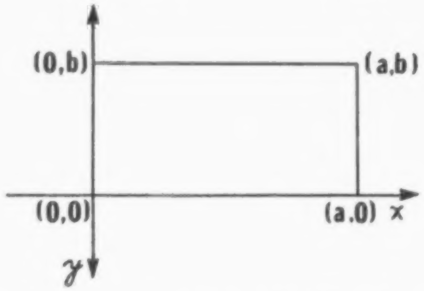


Skills/Subject Area: Geometry Page 2

COMPETENCY GOAL 14: The learner investigate some of the properties of coordinate geometry.

| Objectives | Measures |
|---|---|
| 14.3 Use the distance formula to solve problems. | 14.3.1 Find the length of $\overline{GH}$ if the coordinates of G and H are (-5,4) and (3,-2) respectively.<br>a) $5\sqrt{2}$ b) 10<br>c) $10\sqrt{2}$ d) 15<br>14.3.2 Given the points L($\sqrt{2}$,-3) and M($-\sqrt{2}$,5). Find the distance between L and M. |
| 14.4 Use the midpoint formula to find the coordinates of the midpoint or endpoint of a segment. | 14.4.1 Find the coordinates of the midpoint of a segment with endpoints, A(-2,4) and B(-8,4).<br>a) (-6,4) b) (-10,8)<br>c) (-5,4) d) (-3,2)<br>14.4.2 Find the coordinates of the endpoint A of $\overline{AB}$ given B(3,-2) and the midpoint M(-5,4). |
| 14.5 Find the slope of the line given two points on the line. | 14.5.1 Find the slope of $\overleftrightarrow{CD}$ for C(-3,-7) and D(-2,-5).<br>a) -2 b) 2 c) $-\frac{1}{2}$ d) $\frac{1}{2}$<br>14.5.2 Find the slope of $\overleftrightarrow{AB}$ for A(-1,-4) and B(6,-2). |
| 14.6 Find the slope and y-intercept of a line. | 14.6.1 Given $2x + 3y = 7$, find the slope.<br>a) $-\frac{3}{2}$ b) $\frac{3}{2}$ c) $\frac{2}{3}$ d) $-\frac{2}{3}$<br>14.6.2 Given $y = \frac{1}{2}x + 6$, find the y-intercept. |

COMPETENCY GOAL 14: The learner will investigate some of the properties of coordinate geometry.

| Objectives | Measures |
|---|---|
| 14.7 Write an equation for a line which is parallel or perpendicular to a given line. | 14.7.1 Given the line $3x + y = 4$, find an equation which is perpendicular.<br>a) $y = -\frac{3}{2}x + 5$ b) $y = 3x + 6$<br>c) $y = \frac{1}{3}x + 6$ d) $y = -3x + 6$<br>14.7.2 Given the line $2x + y = 4$, write an equation of a line that is parallel. |
| 14.8 Write the equation and draw the graph of a line when given either two points on the line, one point and the slope of the line, or the slope and y-intercept of the line. | 14.8.1 Given a line having slope of $\frac{5}{6}$ and a point on the line of (-4,3), the equation of the line is:<br>a) $5x - 6y = 39$ b) $5x - 6y = -38$<br>c) $6x - 5y = 38$ d) $4x - 3y = 36$<br>14.8.2 Given a line having points (-3,7) and (4,3), sketch the graph and write the equation. |
| 14.9 Use coordinate geometry to prove some of the properties of polygons. | 14.9.1 Use coordinate geometry to prove that the diagonals of a rectangle are congruent.<br><br> <br>14.9.2 Given a square with A(0,0) B(a,0), c(a,a), and D(0,a). Prove $\overline{AC} \cong \overline{BD}$. |

COMPETENCY GOAL 14: The learner will investigate some of the properties of coordinate geometry.

| Objectives | Measures |
|---|---|
| 14.10 Write an equation of a circle given its center and radius length. | 14.10.1 Write an equation of a circle given center (-2,3) and a radius 4.<br>a) $(x + 2)^2 + (y - 3)^2 = 16$<br>b) $(x - 2)^2 + (y + 3)^2 = 4$<br>c) $(x + 2)^2 + (y - 3)^2 = 4$<br>d) $(x - 2)^2 + (y + 3)^2 = 16$<br>14.10.2 Write an equation of a circle with its center at the origin and with a radius of 6 units. |
| 14.11 Find the center and radius length of a circle given an equation. | 14.11.1 Given the circle $(x-6)^2 + (y-2)^2 = 9$, how long is its radius?<br>a) 2 b) 3 c) 6 d) 9<br>14.11.2 Given the circle $(x-4)^2 + (y+2)^2 = 25$, find its center. |

## Algebra II Outline

1. Language of Algebra

    a. Evaluate expressions.
    b. Convert word phrases into mathematical symbols.
    c. Apply the properties of the real number system.

2. Relations and Functions

    a. Graph relations and functions using number line and the rectangular coordinate plane.
    b. Graph systems of linear equations and inequalities.
    c. Graph conic sections.

3. Real Numbers

    a. Add, subtract, multiply, and divide.
    b. Evaluate expressions which involve exponents.

4. Linear Equations and Inequalities

    a. Solve linear equations and inequalities.
    b. Solve equations and inequalities containing absolute value components.
    c. Solve literal equations and formulas.

5. Systems of Linear Equations

    a. Solve two linear equations in two variables by various methods.
    b. Solve three linear equations in three variables.
    c. Use Cramer's Rule to solve systems of linear equations.
    d. Use determinants to solve systems of linear equations.

6. Polynomials

    a. Add and subtract.
    b. Multiply and use special product formulas.
    c. Divide and use synthetic division.
    d. Factor.
    e. Use the Binomial Theorem.

7. Algebraic Fractions

    a. Multiply and divide.
    b. Add and subtract.
    c. Simplify complex fractions.
    d. Solve equations with algebraic fractions.

8. Radical Expressions

    a. Simplify radicals.
    b. Use fractional exponents.
    c. Find sums and differences of radicals.
    d. Find products and quotients of radicals.
    e. Solve equations with radical expressions.

9. Quadratic Equations

    a. Solve by completing the square.
    b. Use the Quadratic Formula to solve.
    c. Solve systems of two equations by various methods.

10. Complex Numbers

    a. Add and subtract.
    b. Multiply and divide.
    c. Solve quadratic equations with complex roots.

11. Analytic Geometry

    a. Use the distance formula.
    b. Find the midpoint of a line segment.
    c. Find the slope of a line.
    d. Find the equation of a line.
    e. Determine parallel and perpendicular lines.
    f. Use the Pythagorean Theorem.
    g. Explore conic sections.

12. Variation

    a. Solve problems involving direct, inverse, and joint variation.

13. Series

    a. Find the arithmetic mean of a series.
    b. Compute the sum of an arithmetic series.
    c. Find the geometric mean of a series.
    d. Find the sums of finite and infinite geometric series.

14. Exponential Functions

    a. Solve problems using logarithms.
    b. Solve problems involving exponential functions.

15. Techniques for Problem-Solving

    a. Use the Fundamental Counting Principle.
    b. Compute using permutations and combinations.
    c. Employ single probability principles.
    d. Solve "word problems".

16. Trigonometry

    a. Find the sine and cosine of an angle.
    b. Find the values of the six trigonometric functions of an angle.
    c. Solve right triangles given certain information.
    d. Solve problems.

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 1: The learner will use the language of Algebra.

| Objectives | Measures |
|---|---|
| 1.1 Use the order of operations and evaluate algebraic expressions. | 1.1.1 Evaluate:<br>$2a^2 + 3b$ if $a = 3$ and $b = -1$<br>a) 21 b) 33<br>c) 15 d) 9 |
| | 1.1.2 Evaluate: $-2x^3 + 4y$ if $x = 3$, $y = 5$ |
| 1.2 Translate English words and phrases into mathematical language. | 1.2.1 Write in mathematical terms:<br>Three less than twice a number.<br>a) $3-2x$ b) $2x - 3$<br>c) $x^2 - 3$ d) $3 - x^2$ |
| | 1.2.2 Write in mathematical terms:<br>A number increased by six. |
| 1.3 Use the properties of addition to simplify arithmetic and algebraic expressions (Additive Identity, Commutative, Associative, Additive Inverse). | 1.3.1 Simplify:<br>$4x + 3 + 2x - 6 + 5y$<br>a) $6x + 5y - 3$ b) $3x + 5y$<br>c) $11xy - 3$ d) $8xy$ |
| | 1.3.2 Simplify: $5x + y + 2x - 4y$ |
| 1.4 Use the properties of multiplication to simplify arithmetic and algebraic expressions (Multiplicative Identity, Commutative, Associative, Multiplicative Inverse, Multiplication Property of Zero). | 1.4.1 Simplify:<br>$(3y) \frac{1}{2} \cdot 5(2x)$<br>a) $15 + xy$ b) $15xy$<br>c) $\frac{10x + 3y}{2}$ d) $30xy$ |
| | 1.4.2 Simplify: $\frac{3}{5}(5x)(2y) =$ __________ |

Skills/Subject Area: Algebra II

COMPETENCY GOAL 1: The learner will use the language of Algebra.

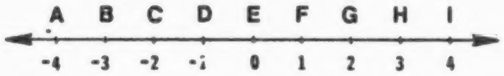
| Objectives | Measures |
|---|---|
| 1.5 Use the Distributive Property of Multiplication over Addition to simplify arithmetic and algebraic expressions. | 1.5.1 Simplify:<br>$4(x + 3y)$<br>a) $x + 12y$ b) $12xy$<br>c) $4x + 12y$ d) $4x + 3y$<br>1.5.2 Simplify: $12(4y - 1) =$ __________ |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 2: The learner will locate numbers on the number line and the coordinate graph.

| Objectives | Measures |
|---|---|
| 2.1 Graph sets of real numbers on the number line. | 2.1.1 List the letters for the points whose coordinates are: -3, 2 |

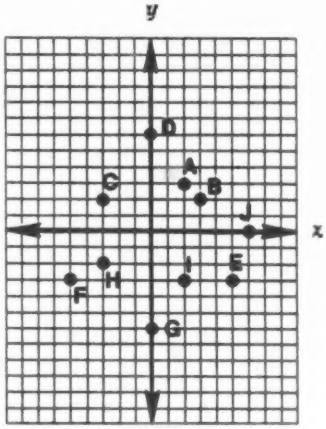


a) C, H b) B, E

c) E, G d) B, G

2.1.2 On a number line graph x if $-1 \leq x < 4$

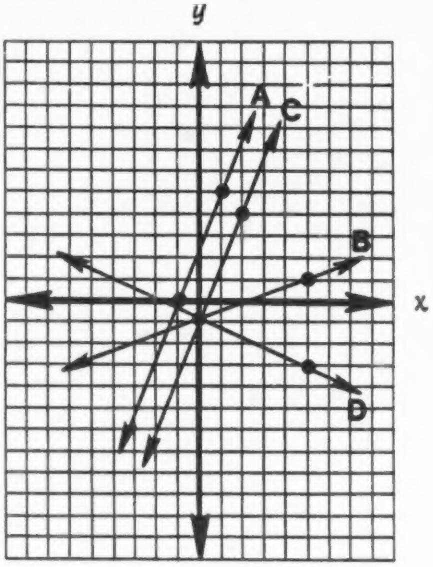
| Objectives | Measures |
|---|---|
| 2.2 Graph ordered pairs of numbers on the coordinate plane and find the coordinates of points on the plane. | 2.2.1 List the letter for the point whose coordinates are: (-3, 2). |



a) H b) B c) C d) I

2.2.2 The letter corresponding to the coordinates (0, 6) on the above grid is ?.

COMPETENCY GOAL 2: The learner will locate numbers on the number line and the coordinate graph.

| Objectives | Measures |
|---|---|
| 2.3 Graph linear equations in two variables. | 2.3.1 Select the appropriate letter for the graph of $2x - 5y = 5$.<br><br> <br>a) A b) B c) C d) D<br>2.3.2 Graph $2x - 3y = 6$. |

COMPETENCY GOAL 2: The learner will locate numbers on the number line and the coordinate graph.

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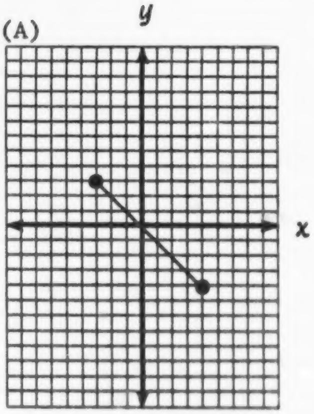
Objectives | Measures

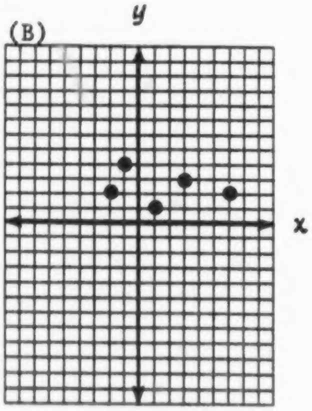
2.4 Graph a relation on the coordinate plane.

2.4.1 Study the following graphs and select the statement which is true :

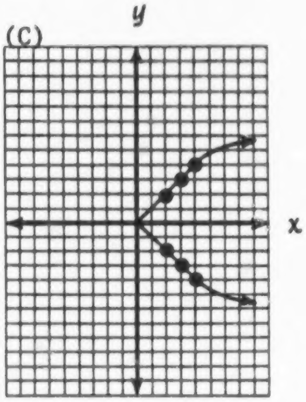
(A)



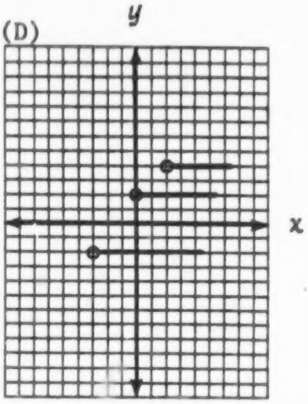
(B)



(C)



(D)



a) A, B, C, and D are graphs of relations.

b) Only A and B are graphs of relations.

c) Only A, B, and C are graphs of relations.

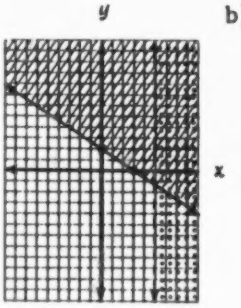
d) Only A is the graph of a relation.

2.4.2 Graph the relation (2, -3)(3, -3), (-2, -3)(-3, -3)

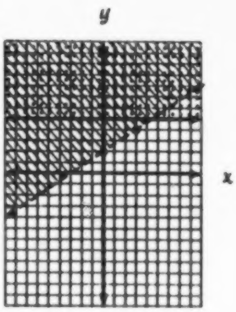
COMPETENCY GOAL 2: The learner will locate numbers on the number line and the coordinate graph.

| Objectives | Measures |
|---|---|
| 2.5 Graph the solution sets of systems of linear inequalities in two variables. | 2.5.1 Select the graph of the solution set for $2x + 3y > 6$<br>$x \geq 5$ |

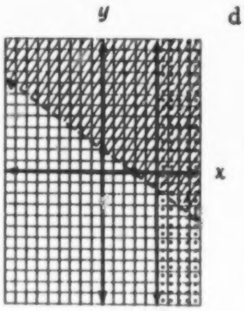
a)



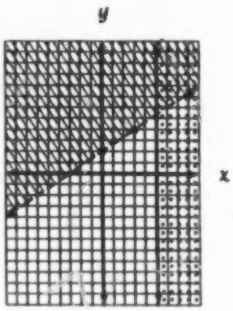
b)



c)



d)

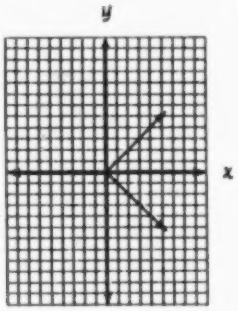


2.5.2 Solve the system $y \leq 2$ and $2x + y < 3$ by graphing.

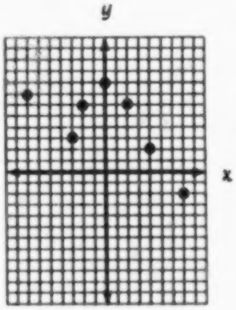
COMPETENCY GOAL 2: The learner will locate numbers on the number line and the coordinate graph.

| Objectives | Measures |
|---|---|
| 2.6 Graph a function on the coordinate plane. | 2.6.1 Select the graph which is not a function. |

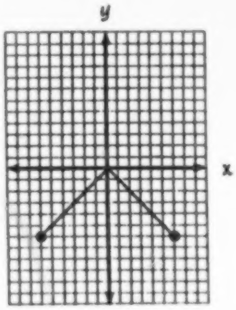
a)



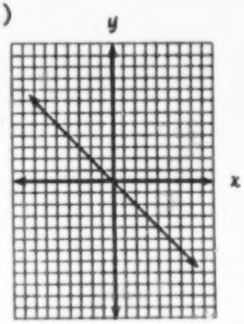
b)



c)



d)

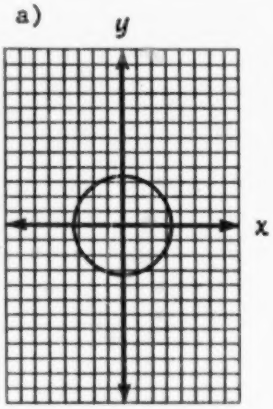


2.6.2 Graph $\{(x, y) \mid y = -|x|\}$ and determine if the graph is that of a function.

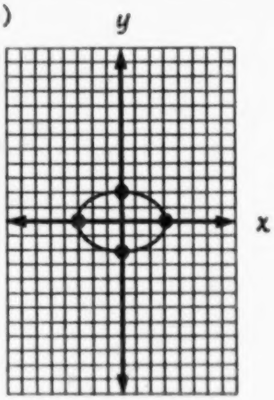
COMPETENCY GOAL 2: The learner will locate numbers on the number line and the coordinate graph.

| Objectives | Measures |
|---|---|
| 2.7 Graph the equations of a parabola, circle, ellipse, and hyperbola. | 2.7.1 Choose the graph that shows a parabola. |

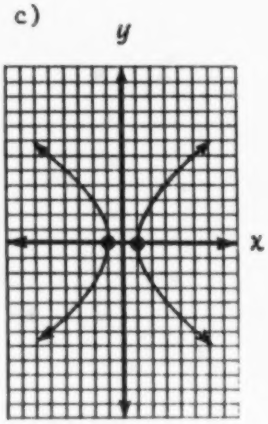
a)



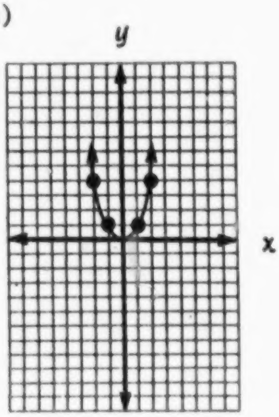
b)



c)



d)



2.7.2 Graph $xy = -2$

MATHEMATICS

Grade Level: 10-12

COMPETENCY GOAL 3: The learner will perform operations with real numbers.

| Objectives | Measures |
|---|---|
| 3.1 Add real numbers. | 3.1.1 Compute:<br>$4\sqrt{5} + \sqrt{5}$<br>a) $5\sqrt{5}$ b) 5<br>c) 20 d) 25 |
| | 3.1.2 Compute: 3.51 + 0.4 + 2 |
| 3.2 Subtract real numbers. | 3.2.1 Compute: 5 - 2 - (-7)<br>a) 10 b) -4<br>c) 0 d) 4 |
| | 3.2.2 Compute: -12 - 7 - 2 |
| 3.3 Multiply real numbers. | 3.3.1 Multiply:<br>(2.5) (-3.1)<br>a) -7.75 b) -0.6<br>c) -77.5 d) -6.5 |
| | 3.3.2 Multiply: (-5) (-1) (-2) |
| 3.4 Divide real numbers. | 3.4.1 Divide:<br>-72 ÷ (-8 ÷ 4)<br>a) -36 b) $\frac{9}{4}$<br>c) 36 d) $\frac{-9}{4}$ |
| | 3.4.2 Divide: -42 ÷ -7 |

COMPETENCY GOAL 3: The learner will perform operations with real numbers.

| Objectives | Measures |
|---|---|
| 3.5 Use < or > to compare two numbers. | 3.5.1 Replace the $\overset{?}{-}$ with < , = , or > to make a true statement.<br>$-\frac{3}{7} \overset{?}{-} -\frac{4}{9}$<br>a) = b) +<br>c) < d) > |
| | 3.5.2 Compare: $-3.51 \overset{?}{-} -3.6$ |
| 3.6 Simplify expressions involving positive, negative and zero exponents. | 3.6.1 Simplify:<br>$\left(\frac{3x^2}{5y}\right)^{-2}$<br>a) $\frac{-9x^4}{25y^2}$ b) $\frac{25y^2}{9x^4}$<br>c) $\frac{3y^2}{5x^4}$ d) $\frac{5y^2}{3x^4}$ |
| | 3.6.2 Simplify: $(2x^2y^3)^3 \quad (3xy)^0$ |
| 3.7 Multiply and divide numbers written in scientific notation. | 3.7.1 Compute and express your answer in scientific notation.<br>$\frac{3 \times 10^{-2}}{5 \times 10^{+2}}$<br>a) $6.0 \times 10^{-4}$ b) $6.0 \times 10^{4}$<br>c) $6.0 \times 10^{-3}$ d) $6.0 \times 10^{-5}$ |
| | 3.7.2 $(6 \times 10^3) \quad (5 \times 10^{-6}) = \underline{\ ?\ }$ |

COMPETENCY GOAL 3: The learner will perform operations with real numbers.

| Objectives | Measures |
|---|---|
| 3.8 Write a rational number as a terminating or repeating decimal. | 3.8.1 Choose the terminating or repeating decimal which represents $\frac{3}{11}$.<br>a) $0.\overline{3}$ b) $0.\overline{27}$<br>c) $0.\overline{28}$ d) 0.27 |
| | 3.8.2 Express $\frac{3}{8}$ as a terminating or repeating decimal. |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 4: The learner will solve linear equations and inequalities.

| Objectives | Measures |
|---|---|
| 4.1 Solve equations in one variable. | 4.1.1 Solve:<br>$3x - 5 = 4x - 3$<br>a) $x = 2$ b) $x = 1\frac{1}{7}$<br>c) $x = -2$ d) $x = 8$<br>4.1.2 Solve: $4(2x + 3) = -2x - 5$ |
| 4.2 Solve equations involving absolute value. | 4.2.1 Solve: $4\lvert x - 2\rvert = 24$<br>a) 8 b) 8, -4<br>c) 4 d) -8, 4<br>4.2.2 Solve: $3\lvert x - 5\rvert - 2 = 34$ |
| 4.3 Solve equations with rational coefficients. | 4.3.1 Solve:<br>$\frac{3}{8} - \frac{1x}{4} = \frac{1}{16}$<br>a) $-\frac{1}{2}$ b) $\frac{5}{4}$<br>c) $-\frac{5}{4}$ d) $\frac{1}{2}$<br>4.3.2 Solve: $\frac{2}{3} - \frac{3x}{5} = \frac{2x}{5} + \frac{4}{3}$ |
| 4.4 Solve literal equations and formulas. | 4.4.1 Solve for x:<br>$a = \frac{x}{b} - c$<br>a) $x = ab - c$ b) $x = ab + bc$<br>c) $x = ab - bc$ d) $x = ab + c$<br>4.4.2 Solve for x: $a = \frac{bx}{c + 2x}$ |

COMPETENCY GOAL 4: The learner will solve linear equations and inequalities.

| Objectives | Measures |
|---|---|
| 4.5 Solve inequalities in one variable. | 4.5.1 Solve: $3 - 2x > 1$<br>a) $x < 1$ b) $x > 1$<br>c) $x < -1$ d) $x > -1$<br>4.5.2 Solve: $42 < -3(x + 2)$ |
| 4.6 Solve inequalities involving absolute value. | 4.6.1 Solve: $3\lvert x + 4\rvert \geq 15$<br>a) $\{x \mid x \leq -1 \text{ or } x \geq -9\}$<br>b) $\{x \mid -9 < x < 1\}$<br>c) $\{x \mid x \geq 1 \text{ or } x \leq -9\}$<br>d) $\{x \mid x \geq -1 \text{ or } x < 9\}$<br>4.6.2 Solve: $\lvert x + 5\rvert - 7 \leq 2$ |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 5: The learner will solve systems of linear equations.

| Objectives | Measures |
|---|---|
| 5.1 Find solution sets of open sentences in two variables with given replacements for the variables. | 5.1.1 Find the ordered pairs (x, y) that satisfy the equation $4x + 2y = 6$ from the set $\{(1, 1), (2, -1), (-2, 1), (-1, -1), (3, -3)\}$.<br>a) (1, 1), (2, -1), (3, -3)<br>b) (1, 1), (2, -1), (-1, -1)<br>c) (-1, -1), (-2, 1)<br>d) (2, -1), (-2, 1) |
|  | 5.1.2 Find the ordered pairs (x, y) that satisfy the equation $2x - 5y = 4$ if $x \in \{-1, 0, 4\}$ |
| 5.2 Find the solution sets of systems of two linear equations in two variables. | 5.2.1 Find the solution set:<br>$5x + 2y = -8$<br>$4x + 3y = 2$<br>a) (0, -4) b) $(\frac{1}{2}, 0)$<br>c) ∅ d) (-4, 6) |
|  | 5.2.2 Find the solution set:<br>$3x - 5y = -13$<br>$4x + 3y = 2$ |

| Objectives | Measures |
|---|---|
| 5.3 Use systems of two linear equations in two variables to solve problems. | 5.3.1 Select the appropriate system of equations for solving the following problem:<br>Tickets for a dinner-dance were \$20.00 for a single ticket or \$35 for a couple. If 128 people attended the event, and ticket sales totaled \$2,280, how many single tickets and how many couple's tickets were sold?<br>a) $20x + 35y = 2280$, $2x + y = 128$<br>b) $20x + 35y = 2280$, $x + 2y = 128$<br>c) $20x + 35y = 2280$, $x + y = 128$<br>d) $x + y = 2280$, $20x + 35y = 128$ |
| | 5.3.2 Solve using a system of equations:<br>If the difference in measure of two supplementary angles is $40^\circ$, what are the measures of the angles? |
| 5.4 Find the solution sets of systems of three linear equations in three variables. | 5.4.1 Solve:<br>$x - 2y + 3z = 9$<br>$3x - y + z = -7$<br>$5y + 4z = 2$<br>a) (4, 2, 3) b) (0, 6, -7)<br>c) (-4, -2, 3) d) (1, 2, -2) |
| | 5.4.2 Solve for x:<br>$x + y - 3z = 8$<br>$2x - 3y + z = -6$<br>$3x + 4y - 2z = 20$ |

COMPETENCY GOAL 5: The learner will solve systems of linear equations.

| Objectives | Measures |
|---|---|

*5.5 **Solve systems of linear equations by reducing the matrix of coefficients to triangular form.**

5.5.1 Select the appropriate matrix for solving

$$\begin{aligned} r - 2s + 3t &= 4 \\ 2r + s - 4t &= 3 \\ -3r - t &= -14 \end{aligned}$$

a) $\begin{bmatrix} 1 & -2 & 3 & 4 \\ 2 & 1 & -4 & 3 \\ -3 & -1 & 0 & -14 \end{bmatrix}$

b) $\begin{bmatrix} 1 & -2 & 3 & -4 \\ 2 & 1 & -4 & -3 \\ -3 & -1 & 14 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 1 & -2 & 3 & 4 \\ 2 & 1 & -4 & 3 \\ -3 & 0 & -1 & -14 \end{bmatrix}$

d) $\begin{bmatrix} 1 & -2 & 3 & -4 \\ 2 & 0 & -4 & -3 \\ -3 & 0 & -1 & 14 \end{bmatrix}$

5.5.2 Solve by reducing the matrix of coefficients to triangular form.

$$\begin{aligned} 2x + y + z &= 6 \\ x + 3y - 2z &= 13 \\ x - 2y - 3z &= -1 \end{aligned}$$

5.6 Solve systems of linear equations by using Cramer's Rule.

5.6.1 Select the appropriate determinants for solving for y by Cramer's Rule in the system

$$\begin{aligned} 2x - 3y &= -4 \\ 5x + 7y &= 1 \end{aligned}$$

a) $y = \dfrac{\begin{vmatrix} -4 & -3 \\ 1 & 7 \end{vmatrix}}{\begin{vmatrix} 2 & -3 \\ 5 & 7 \end{vmatrix}}$

c) $y = \dfrac{\begin{vmatrix} 2 & -3 \\ 5 & 7 \end{vmatrix}}{\begin{vmatrix} 2 & -4 \\ 5 & 1 \end{vmatrix}}$

b) $y = \dfrac{\begin{vmatrix} 2 & -4 \\ 5 & 1 \end{vmatrix}}{\begin{vmatrix} 2 & -3 \\ 5 & 7 \end{vmatrix}}$

d) $y = \dfrac{\begin{vmatrix} 2 & 3 \\ 5 & 7 \end{vmatrix}}{\begin{vmatrix} 2 & -3 \\ 5 & 7 \end{vmatrix}}$

5.6.2 Solve using Cramer's Rule

$$\begin{aligned} 3x + 2y &= 5 \\ 5x - 6y &= 11 \end{aligned}$$

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 6: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 6.1 Add polynomials. | 6.1.1 Add:<br>$(p^2 + 7p - 5) + (3p^2 + 3p + 7)$<br>a) $3p^2 + 10p + 2$<br>b) $4p^2 + 10p + 2$<br>c) $4p^4 + 10p^2 + 2$<br>d) $3p^4 + 10p^2 + 2$ |
| | 6.1.2 Add: $(8r^3 + 5r + 14) + (2r^2 + 3r -8)$ |
| 6.2 Subtract polynomials. | 6.2.1 Subtract:<br>$(4k^2 - 14) - (3k^2 + 7k - 5)$<br>a) $k^2 + 7k - 9$<br>b) $k^2 + 7k - 19$<br>c) $k^2 - 7k - 19$<br>d) $k^2 - 7k - 9$ |
| | 6.2.2 Subtract:<br>$(3x^2 + 2x - 7) - (2x^2 - 3x - 5)$ |
| 6.3 Multiply a polynomial by a monomial. | 6.3.1 Multiply:<br>$3x^2y\ (2x^2 - 5xy + 6y^2)$<br>a) $6x^4y - 15x^2y + 18x^2y^2$<br>b) $6x^4y - 15x^3y^2 + 18x^2y^3$<br>c) $6x^2y - 15x^2y + 18x^2y^2$<br>d) $6x^4y - 5xy + 6y^2$ |
| | 6.3.2 Multiply: $2x^2\ (3x^2 - 7xy -3)$ |

COMPETENCY GOAL 6: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 6.4 Multiply two binomials by using special product formulas (square of a binomial, product of the sum and difference of two binomials). | 6.4.1 Simplify:<br>$(3x + 2)^2$<br>a) $9x + 4$ b) $9x^2 + 4$<br>c) $9x^2 + 6x + 4$ d) $9x^2 + 12x + 4$<br>6.4.2 Simplify: $(3x - 5)(3x + 5)$ |
| 6.5 Multiply a binomial and a polynomial. | 6.5.1 Multiply:<br>$(2t - 5)(t^2 + 3t + 4)$<br>a) $2t^3 - 1t^2 + 23t - 20$<br>b) $2t^3 + 1t^2 - 7t - 20$<br>c) $2t^3 + 6t^2 + 8t - 20$<br>d) $2t^3 + 11t^2 + 23t + 20$<br>6.5.2 Multiply: $(a + b)(a^2 - ab + b^2)$ |
| 6.6 Find the quotient of two monomials. | 6.6.1 Simplify:<br>$\frac{-12m^{10}x^9}{4m^2x^3}$<br>a) $-3m^5x^3$ b) $-3m^8x^6$<br>c) $-8m^8x^6$ d) $-8m^5x^6$<br>6.6.2 Simplify: $\frac{18x^2y^6}{27x^4y^3}$ |
| 6.7 Divide one polynomial by another one of lower degree. | 6.7.1 Divide $6a^3 + 5a^2 + 9$ by $2a + 3$<br>a) $3a^3 + 5a^2 + 3$ b) $3a^2 + 2a + 3$<br>c) $3a^2 - 2a + 3$ d) $3a^2 + 7a + 3$<br>6.7.2 Divide $m^3 + 3m^2 - 7m - 21$ by $m^2 - 7$ |

| Objectives | Measures |
|---|---|

6.8 Use synthetic division to divide a polynomial by a linear binomial.

6.8.1 Select the appropriate illustration for using synthetic division to find $(2a^3 + a^2 + 12) \div (a + 2)$

a) $$\begin{array}{r|rrr} -2 & 2 & 1 & 12 \\ & & -4 & 6 \\ \hline & 2 & -3 & 18 \end{array}$$

b) $$\begin{array}{r|rrrr} -2 & 2 & 1 & 0 & 12 \\ & & -4 & 6 & -12 \\ \hline & 2 & -3 & 6 & 0 \end{array}$$

c) $$\begin{array}{r|rrr} 2 & 2 & 1 & 12 \\ & & 4 & 10 \\ \hline & 2 & 5 & 22 \end{array}$$

d) $$\begin{array}{r|rrrr} 2 & 2 & 1 & 0 & 12 \\ & & 4 & 10 & 20 \\ \hline & 2. & 5 & 10 & 32 \end{array}$$

6.8.2 Use synthetic division to find $(2x^3 - 3x^2 + 3x - 4) \div (x - 2)$.

6.9 Factor monomials and find the greatest common factor (GCF) and least common multiple (LCM) of two or more monomials.

6.9.1 Find the greatest common factor and least common multiple of $30a^2b^3$ and $80a^3b^2c$.

a) $10ab$, $240a^5b^5c$

b) $10ab$, $240abc$

c) $10a^2b^2$, $240abc$

d) $10a^2b^2$, $240a^3b^3c$

6.9.2 Find the greatest common factor and least common multiple of $51xy^2z^2$ and $68x^3y$.

COMPETENCY GOAL 6: The learner will perform operations with polynomials.

| Objectives | | Measures |
|---|---|---|
| 6.10 Factor special polynomials (perfect square trinomials, difference of two squares, sum or difference of two cubes). | 6.10.1 | Using the formula<br>$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$<br>to factor $8a^6 - 27b^3$, what values would you substitute for x and y to use the formula?<br>a) $x = 2a$, $y = 3b$<br>b) $x = 2a^2$, $y = 3b$<br>c) $x = 4a^3$, $y = \frac{27b}{2}$<br>d) $x = 4a^3$, $y = 3b$ |
| | 6.10.2 | Factor $(4a^2 - 9t^2)$ |
| 6.11 Factor quadratic polynomials. | 6.11.1 | Suppose $ax^2 + bx + c$ where $b < 0$ and $c < 0$, when factored completely is $(rx + s)(tx + w)$. Which of the following statements would be true?<br>a) $s > 0$ and $w > 0$<br>b) $s < 0$ and $w < 0$<br>c) either $s > 0$ and $w < 0$ or $s < 0$ and $w > 0$<br>d) $rw + st > 0$ |
| | 6.11.2 | Factor $6x^2 + 11x - 35$. |
| 6.12 Use factoring to solve an equation. | 6.12.1 | Solve:<br>$x^2 - 5x = 6$<br>a) $\{-2, -3\}$<br>b) $\{-1, 6\}$<br>c) $\{1, -6\}$<br>d) $\{2, 3\}$ |
| | 6.12.2 | Solve: $8x^2 - 5x = 0$ |

COMPETENCY GOAL 6: The learner will perform operations with polynomials.

| Objectives | Measures |
|---|---|
| 6.13 Use polynomial equations to solve problems. | 6.13.1 Choose the equation used to solve the following problem.<br>Separate 42 into two parts such that the second is the square of the first.<br>a) $(x)(x^2) = 42$<br>b) $x^2 + x = 42$<br>c) $x(42 - x) = x^2$<br>d) $x^2 + x = 42 - x$<br>6.13.2 Solve:<br>The length of one side of a square miniature circuit board is decreased by 1 mm and that of an adjacent side is increased by 2 mm in order to fit a rectangular opening. If the area of the rectangle is 180 mm$^2$, find the length of a side of the original circuit board. |
| 6.14 Use factoring to solve inequalities. | 6.14.1 Find the solution set for<br>$x^2 < -7x - 10$<br>a) $\{ x \mid x < -5 \text{ U } x > -2 \}$<br>b) $\{ x \mid -5 < x < -2 \}$<br>c) $\{ x \mid 2 < x < 5 \}$<br>d) $\{ x \mid x < 2 \text{ U } x > 5 \}$<br>6.14.2 Find the solution set for $x^3 - x \geq 0$. |

COMPETENCY GOAL 6: The learner will perform operations with polynomials.

| Objectives | | Measures | |
|---|---|---|---|
| 6.15 | Factor polynomials completely. | 6.15.1 | Select the example which shows a polynomial factored completely.<br>a) $2x^3 - 4x^2 + 2x = 2x (x^2 - 2x + 1)$<br>b) $2x^2 + 14x + 20 = (2x + 4)(x + 5)$<br>c) $3x^2 + 3xy = 3 (x^2 + xy)$<br>d) $4x^2y - 9y = y (2x - 3)(2x + 3)$ |
| | | 6.15.2 | Factor completely $2x^3 - 4x^2 + 2x$. |
| 6.16 | Expand powers of binomials using Pascal's triangle or the binomial theorem. | 6.16.1 | Use the binomial theorem or Pascal's triangle to find in simplified form the first three terms of the product $(x^2 + 2y)^8$<br>a) $x^8 + 16x^7y + 112x^6y^2$<br>b) $x^{16} + 8x^{14}y + 28x^{12}y^2$<br>c) $x^{16} + 16x^{14}y + 112^{12}y^2$<br>d) $x^8 + 8x^7y + 28x^6y^2$ |
| | | 6.16.2 | Find the product in simplest terms $(2x + y)^6$. |
| 6.17 | Use the binomial theorem to find a specified term of an expansion. | 6.17.1 | Find the fifth term of the product $(2x^3 + \sqrt{3})^6$ in simplest form.<br>a) $15\sqrt{3}x^2$ b) $15x^6$<br>c) $540x^6$ d) $540x^2$ |
| | | 6.17.2 | Find the fourth term of the product $(5x - y)^6$ in simplest form. |

## MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 7: The learner will perform operations with algebraic fractions.

| Objectives | Measures |
|---|---|
| 7.1 Write algebraic fractions in lowest terms. | 7.1.1 Write as a fraction in lowest terms.<br>$\frac{x^2 - 9}{x^2 + x - 6}$<br>a) $\frac{-3}{x-2}$ b) $\frac{3}{2}$<br>c) $\frac{x + 3}{x + 2}$ d) $\frac{x - 3}{x - 2}$<br>7.1.2 Simplify: $\frac{s^2 - s}{s^2 + s - 2}$ |
| 7.2 Simplify products and quotients of rational algebraic expressions. | 7.2.1 Simplify:<br>$\frac{2x^2 + 7x + 3}{1 - 4x^2} \cdot \frac{6x^2 - 13x + 5}{3x^2 + 4x - 15}$<br>a) $\frac{(2x - 5)(3x + 1)}{(3x - 5)(1 - 2x)}$ b) $-1$<br>c) $1$ d) $0$<br>7.2.2 Simplify: $\frac{5c - 10}{3x + 3y} \div \frac{2c^2 - 8}{x^2 + 2xy + y^2}$ |
| 7.3 Simplify sums and differences of rational algebraic expressions. | 7.3.1 Simplify:<br>$\frac{5x}{x^2 - 25} - \frac{2}{x - 5}$<br>a) $\frac{3x - 10}{(x-5)(x+5)}$ b) $\frac{3x + 10}{(x-5)(x+5)}$<br>c) $\frac{5x - 2}{(x-5)(x+5)}$ d) $\frac{3x}{(x-5)(x+5)}$<br>7.3.2 Simplify: $\frac{2}{y^2-4y-5} + \frac{5}{y^2-2y-15}$ |

COMPETENCY GOAL 7: The learner will perform operations with algebraic fractions.

| Objectives | Measures |
|---|---|
| 7.4 Simplify complex fractions. | 7.4.1 Simplify:<br>$\dfrac{\frac{1}{5a^2} - \frac{2}{b}}{\frac{7}{10a} + \frac{3}{2b^2}}$<br>a) $\dfrac{7ab^2 + 15a^2}{2b^2 - 20a^2b}$ b) $\dfrac{2b^2 - 20a^2b}{10a^2b^2}$<br>c) $\dfrac{2b^2 - 20a^2b}{7ab^2 + 15a^2}$ d) $\dfrac{7ab^2 + 15a^2}{10a^2b^2}$ |
| | 7.4.2 Simplify: $\dfrac{\frac{6}{a + 3} - \frac{4}{a - 4}}{\frac{2}{a - 4} + \frac{5}{a + 3}}$ |
| 7.5 Solve fractional equations. | 7.5.1 Find the solution set.<br>$\dfrac{2x - 9}{x - 7} + \dfrac{x}{2} = \dfrac{5}{x - 7}$<br>a) $\{7, -4\}$ b) $\emptyset$ c) $\{7\}$ d) $\{-4\}$ |
| | 7.5.2 Solve: $\dfrac{3}{2x^2} - \dfrac{2}{5x} = \dfrac{7}{4x^2}$ |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 8: The learner will solve problems involving radical expression.

| Objectives | Measures |
|---|---|
| 8.1 Simplify roots of real numbers. | 8.1.1 Simplify: $\sqrt{72}$<br>a) $3\sqrt{8}$ b) $6\sqrt{2}$<br>c) $2\sqrt{6}$ d) $8\sqrt{9}$ |
| | 8.1.2 Simplify: $\sqrt{18}$ |
| 8.2 Simplify expressions involving fractional exponents. | 8.2.1 Evaluate: $27^{\frac{2}{3}}$<br>a) 6 b) $\frac{1}{9}$ c) 9 d) 18 |
| | 8.2.2 Evaluate:$16^{\frac{3}{2}}$. |
| 8.3 Estimate the value of radicals representing irrational numbers. | 8.3.1 Estimate the value to four significant digits.<br>$2\sqrt{12}$<br>a) 1.732 b) 3.464<br>c) 6.928 d) 4.732 |
| | 8.3.2 Between what two whole numbers is $\sqrt{125}$ located? |
| 8.4 Simplify expressions involving sums and differences of radicals. | 8.4.1 Simplify: $\sqrt{8} + \sqrt{12} + \sqrt{50}$<br>a) $\sqrt{70}$ b) $7\sqrt{2} + 2\sqrt{3}$<br>c) $10\sqrt{2}$ d) $2\sqrt{2} + 4\sqrt{3} + 5\sqrt{10}$ |
| | 8.4.2 Simplify: $\sqrt{48} + \sqrt{5} + \sqrt{80} - \sqrt{27}$ |

## COMPETENCY GOAL 8: The learner will solve problems involving radical expression.

| Objectives | Measures |
|---|---|
| 8.5 Simplify expressions involving products and quotients of radicals. | 8.5.1 Simplify: $\dfrac{\sqrt{12b^3}}{\sqrt{3b}}$<br>a) $4b^2$ b) $2b$<br>c) $2b^2$ d) $2b\sqrt{b}$<br>8.5.2 Simplify: $(2\sqrt{7} - 3\sqrt{5})(\sqrt{7}-\sqrt{5})$ |
| 8.6 Indicate the square root of a negative number as a complex number. | 8.6.1 Simplify: $\sqrt{-20}$<br>a) $2\sqrt{5}$ b) $-2\sqrt{5}$<br>c) $2i\sqrt{5}$ d) $5i\sqrt{2}$<br>8.6.2 Simplify: $\sqrt{-49}$ |
| 8.7 Solve equations which contain radical expressions. | 8.7.1 Find the solution set of $3 + \sqrt{3x+1} = x$.<br>a) {1, 8} b) {8}<br>c) $\emptyset$ d) {1}<br>8.7.2 Find the solution set of $\sqrt{2x} = -4$. |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 9: The learner will solve quadratic equations.

| Objectives | Measures |
|---|---|
| 9.1 Complete the square to solve quadratic equations. | 9.1.1 Select the quantity which would be added to each side of the equation if you solved<br>$x^2 - 3x - 9 = 0$ by completing the square.<br>a) $\frac{3}{2}$ b) $\frac{9}{4}$<br>c) $-\frac{3}{2}$ d) 6<br>9.1.2 Find the solution set of<br>$x^2 + 10x + 4 = 0$ by completing the square. |
| 9.2 Use the Quadratic Formula to solve quadratic equations. | 9.2.1 Choose the appropriate values for a,b,c in using the Quadratic Formula to solve $3x^2 + 1 = 6x$.<br>a) $a = 2$, $b = 1$, $c = 6$<br>b) $a = 3$, $b = 6$, $c = 1$<br>c) $a = 3$, $b = 1$, $c = -6$<br>d) $a = 3$, $b = -6$, $c = 1$<br>9.2.2 Use the Quadratic Formula to solve<br>$3x^2 + 4x - 2 = 0$ |

COMPETENCY GOAL 9: The learner will solve quadratic equations.

| Objectives | Measures |
|---|---|
| 9.3 Use the discriminant of a quadratic equation to determine the nature of the roots. | 9.3.1 The discriminant for a quadratic equation is $b^2 - 4ac$. Which of the following statements is not true?<br>a) If $b^2 - 4ac > 0$, there are 2 solutions to the equation.<br>b) If $b^2 - 4ac = 0$, there is 1 solution to the equation.<br>c) If $b^2 - 4ac < 0$, there are no real solutions to the equation.<br>d) If $b^2 - 4a < 0$, there are 2 real solutions to the equation. |
|  | 9.3.2 Compute the discriminant for $2x^2 + 3x + 4 = 0$ and describe the nature of the solutions. |
| 9.4 Write a quadratic equation given its solution set. | 9.4.1 Write a quadratic equation which has the given solution set.<br>$\left\{ \frac{1}{2}, -\frac{1}{4} \right\}$<br>a) $8x^2 - 2x - 1 = 0$<br>b) $8x^2 + 2x - 1 = 0$<br>c) $4x^2 - x - 1 = 0$<br>d) $8x^2 + 3x - 1 = 0$ |
|  | 9.4.2 $2 \pm \sqrt{7}$ is the solution to what quadratic equation. |

**COMPETENCY GOAL 9:** The learner will solve quadratic equations.

| Objectives | Measures |
|---|---|
| 9.5 Find the sum and the product of the solutions of a quadratic equation. | 9.5.1 Find the sum and the product of the solutions for the given quadratic equation.<br>$2x^2 - 5x - 3 = 0$<br>a) sum $\frac{5}{2}$ product $-\frac{3}{2}$<br>b) sum $-2$ product $-3$<br>c) sum $-\frac{5}{2}$ product $-\frac{3}{2}$<br>d) sum $-5$ product $-3$<br>9.5.2 Given $4x^2 + 3x - 12 = 0$. Find the sum and the product of the solutions for the given quadratic equation. |
| 9.6 Solve a system of two equations in which one or both of the equations are quadratic. | 9.6.1 Find the solution set for<br>$x^2 + 2y^2 = 10$<br>$3x^2 - 9 = y^2$<br>a) $(2,\sqrt{3})(-2,\sqrt{3})$<br>b) $(-2,\sqrt{3})(-2, -\sqrt{3})$<br>c) $(2,\sqrt{3})(-2,\sqrt{3})(2, -\sqrt{3})(-2, -\sqrt{3})$<br>d) $(2,\sqrt{3})(2, -\sqrt{3})$<br>9.6.2 Solve $x^2 + y^2 = 9$<br>$x + y = 7$ |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 10: The learner will solve problems involving complex numbers.

| Objectives | Measures |
|---|---|
| 10.1 Add and subtract complex numbers. | 10.1.1 Simplify:<br>$(6 - i) - (6 + i) + (2 - i)$<br>a) $14 - i$ b) $2 - i$<br>c) $2 - 3i$ d) $14 - 3i$ |
| | 10.1.2 Simplify: $(2 + 6i) - (3 - 7i)$ |
| 10.2 Simplify expressions involving products and quotients of complex numbers. | 10.2.1 Simplify:<br>$(3 + 4i)^2$<br>a) $-7 + 24i$ b) $25 + 24i$<br>c) $-7$ d) $9 + 16i^2$ |
| | 10.2.2 Simplify: $\frac{4 + 3i}{1 - 2i}$ |
| 10.3 Solve quadratic equations involving complex roots. | 10.3.1 Solve $2x^2 + 2x = -3$.<br>a) $x = \frac{-1 \pm \sqrt{5}}{2}$<br>b) $x = \frac{-1 \pm i\sqrt{5}}{2}$<br>c) $x = \frac{-1 \pm 2i\sqrt{5}}{2}$<br>d) $x = \frac{-1 \pm 2\sqrt{5}}{2}$ |
| | 10.3.2 Solve $6t^2 - 2t + 1 = 0$. |

# MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 11: The learner will use analytic geometry to solve problems.

| Objectives | Measures |
|---|---|
| 11.1 Use the distance formula. | 11.1.1 Use the distance formula to find the distance between the pair of points with the following coordinates.<br>(4, 6) and (2, 10)<br>a) 20 b) $2\sqrt{5}$<br>c) $2\sqrt{13}$ d) 6 |
| | 11.1.2 Find the distance between: (-2, 5) and (6, 11). |
| 11.2 Determine the coordinates of the midpoint of a segment. | 11.2.1 Find the coordinates of the midpoint of a line segment with the endpoints having the following coordinates.<br>(-7, -3) (-4, 3)<br>a) $\left(\frac{-11}{2}, 0\right)$ b) $\left(\frac{-3}{2}, -3\right)$<br>c) $\left(\frac{3}{2}, 3\right)$ d) $\left(\frac{11}{2}, 0\right)$ |
| | 11.2.2 Given a segment with endpoints (9, 3)(-6,-8). Find the coordinates of its midpoint. |
| 11.3 Find the slope of a line given two points on a line, an equation of the line or the graph of a line. | 11.3.1 Determine the slope of the line that passes through (0, -5) and (1, -3).<br>a) -8 b) -2 c) $\frac{1}{2}$ d) 2 |
| | 11.3.2 State the slope of the line with equation $2x - 3y = 4$. |

**COMPETENCY GOAL 11:** The learner will use analytic geometry to solve problems.

| | Objectives | | Measures |
|---|---|---|---|
| 11.4 | Find an equation of a line, given its slope and the coordinates of a point on the line, or the coordinates of two points on the line, or its slope and y-intercept. | 11.4.1 | Write in slope-intercept form the equation of a line which passes through (-2,5) and (3,0).<br>a) $y = -2x + 5$ b) $y = -x + 3$<br>c) $y = x - 3$ d) $y = 3$ |
| | | 11.4.2 | Write in $Ax + By = C$ form the equation of a line with slope $-\frac{4}{3}$ which passes through the point (5,6). |
| 11.5 | Determine if two lines are parallel or perpendicular by examining their slopes. | 11.5.1 | By examining the slopes for the equations of two lines, determine if the two lines are parallel, perpendicular, horizontal or vertical.<br>$3x + 2y = 5$<br>$2x - 3y = 1$<br>a) parallel b) perpendicular<br>c) horizontal d) vertical |
| | | 11.5.2 | Given: $y + x = 6$<br>$y = -x - 4$<br>Are the lines represented by the equations parallel? perpendicular? |
| 11.6 | Use the Pythagorean Theorem and its converse to solve problems. | 11.6.1 | The length of one leg of a right triangle is 5 and the length of the hypotenuse is 10. Find the length of the other leg.<br>a) 5 b) $5\sqrt{3}$<br>c) $5\sqrt{2}$ d) $3\sqrt{5}$ |
| | | 11.6.2 | Is a triangle with sides 6, 8, 11 a right triangle? Show your work to support your conclusion. |

COMPETENCY GOAL 11: The learner will use analytic geometry to solve problems.

| Objectives | Measures |
|---|---|
| 11.7 Write the equation of a circle from its geometric properties. | 11.7.1 Write the equation of a circle with center (2, -1) and radius 4.<br>a) $(x - 2)^2 + (y + 1)^2 = 16$<br>b) $(x + 2)^2 + (y - 1)^2 = 16$<br>c) $(x - 2)^2 + (y + 1)^2 = 4$<br>d) $(x + 2)^2 + (y - 1)^2 = 4$ |
|  | 11.7.2 State the center and radius of the circle with equation<br>$x^2 + 2x + y^2 = 0$ |
| 11.8 Identify parabolas, circles, ellipses and hyperbolas from their equations. | 11.8.1 Identify the conic section whose equation is given.<br>$x^2 - 2y^2 = 8$<br>a) hyperbola b) circle<br>c) ellipse d) parabola |
|  | 11.8.2 Given: $4x^2 + 3y^2 = 15$. What conic section does it represent? |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 12: The learner will solve problems involving variation.

| Objectives | Measures |
|---|---|
| 12.1 Use direct variation to solve problems. | 12.1.1 Choose the equation which does not represent a direct variation.<br>a) $y = 15x$ b) $y = 3x + 7$<br>c) $y = 2x^2$ d) $y = -3x$ |
| | 12.1.2 y varies directly as x and $y = 16$ when $x = -4$. Find y when $x = 8$. |
| 12.2 Use inverse variation to solve problems. | 12.2.1 Choose the equation which does not represent an inverse variation.<br>a) $xy = 12$ b) $\frac{y}{x} = 10$<br>c) $y = \frac{16}{x}$ d) $x = \frac{12}{y}$ |
| | 12.2.2 If x varies inversely as $y^2$ and if $x = 3$ when $y = 4$, find x when $y = 2$. |
| 12.3 Use joint variation to solve problems. | 12.3.1 Choose the equation which represents a joint variation.<br>a) $xy = 15$ b) $y = 150x$<br>c) $\frac{xz}{y} = 3$ d) $x = \frac{12}{y}$ |
| | 12.3.2 y varies jointly as x and z. $y = 12$ when $x = 3$ and $z = 2$. Find y when $x = 5$ and $z = 6$. |

# MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 13: The learner will solve problems involving arithmetic and geometric sequences and series.

| Objectives | Measures |
|---|---|
| 13.1 Complete arithmetic sequences (progressions) and find arithmetic means. | 13.1.1 Write the next number in the arithmetic progression $3, 5-\sqrt{2}, 7-2\sqrt{2}, 2, \ldots$<br>a) $9 - 3\sqrt{2}$ b) $9 - 4\sqrt{2}$<br>c) $9 + 3\sqrt{2}$ d) $9 - 2\sqrt{2}$ |
| | 13.1.2 Find two arithmetic means between 10 and -14. |
| 13.2 Find a given term in an arithmetic sequence (progression). | 13.2.1 Find the 21st term of the progression 8, 3, -2, -7, . . .<br>a) -108 b) -87<br>c) -97 d) -92 |
| | 13.2.2 Find the 21st term of the progression $3 + 2i, 4 + i, 5, \ldots$ |
| 13.3 Find the sums of arithmetic series and use summation notation. | 13.3.1 Write the arithmetic series 7 + 10 + 13 + . . . + 31 using the summation notation.<br>a) $\sum_{k=7}^{31} (3k + 4)$ b) $\sum_{k=1}^{9} (3k + 4)$<br>c) $\sum_{k=4}^{9} (k + 3)$ d) $\sum_{k=0}^{8} (3k + 4)$ |
| | 13.3.2 Find the sum of the first twenty terms of the series 5 + 15 + 25 + 35 + . . . |

COMPETENCY GOAL 13: The learner will solve problems involving arithmetic and geometric sequences and series.

| Objectives | | Measures | |
|---|---|---|---|
| 13.4 | Complete geometric sequences (progressions) and find geometric means. | 13.4.1 | Find two geometric means between -3 and 24.<br>a) 6, 15 b) -6, 12<br>c) 6, 12 d) 6, -12 |
| | | 13.4.2 | Write the next three terms in the geometric progression $-\frac{1}{3}$, 1, -3 . . . |
| 13.5 | Find a given term in a geometric sequence (progression). | 13.5.1 | Find the 11th term of the geometric progression 8, 4, 2, 1, . . .<br>a) 22 b) $\frac{1}{64}$<br>c) $\frac{1}{256}$ d) $\frac{1}{128}$ |
| | | 13.5.2 | Find the seventh term of a geometric progression with the first term 2 and the common ratio $\sqrt{3}$. |
| 13.6 | Find the sum of a finite geometric series. | 13.6.1 | Find the sum of a geometric series with first term 40.5, last term 8 and a common ratio $-\frac{2}{3}$.<br>a) 32.5 b) 27.5<br>c) 105.5 d) 26.5 |
| | | 13.6.2 | Find the sum of a geometric series if $a = 3$, $r = 2$, and $n = 6$. |
| 13.7 | Find the sum of a geometric series having infinitely many terms. | 13.7.1 | Find the sum of an infinite geometric series 8 + 4 + 2 + 1 + . . .<br>a) 15 b) 16 c) 17 d) $\infty$ |
| | | 13.7.2 | Find the sum of an infinite geometric series if it has a sum. If it has no sum, so state.<br>$8 - 2 + \frac{1}{2} - \frac{1}{8} + \ldots$ |

MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 14: The learner will solve problems involving logarithmic and exponential functions.

| Objectives | Measures |
|---|---|
| 14.1 Write an exponential function as a logarithmic function and write a logarithmic function as an exponential function. | 14.1.1 Rewrite $5^{-2} = \frac{1}{25}$ as an equation in logarithmic form.<br>a) $\log_5 -2 = \frac{1}{25}$<br>b) $\log_5\left(\frac{1}{25}\right) = -2$<br>c) $\log_{-2}\left(\frac{1}{25}\right) = 5$<br>d) $\log_{-2} 5 = \frac{1}{25}$ |
| | 14.1.2 Rewrite $\log_3 9 = 2$ in exponential form. |
| 14.2 Use a scientific calculator to evaluate products, quotients, powers, and roots. | 14.2.1 Evaluate to four significant digits:<br>$\frac{\sqrt[4]{84.37}}{321.5}$<br>a) 0.009427 b) 0.09427<br>c) 0.0427 d) 9.427 |
| | 14.2.2 Evaluate:<br>$\sqrt[3]{(3.29)(63)^2}$ |
| 14.3 Find the logarithms of numbers by using a base other than 10. | 14.3.1 Find the logarithm:<br>$\log_2 \sqrt[5]{16}$<br>a) $\frac{2}{5}$ b) $\frac{4}{5}$ c) 4 d) $\frac{1}{5}$ |
| | 14.3.2 $\log_3\left(\frac{1}{9}\right) = \underline{?}$ |

COMPETENCY GOAL 14: The learner will solve problems involving logarithmic and exponential functions.

| Objectives | Measures |
|---|---|
| 14.4 Solve problems involving exponential equations. | 14.4.1 Solve $9^{2x -1} = 5$ for x to three significant digits.<br>a) $x = 1.7326$ b) $x = 0.866$<br>c) $x = 0.7326$ d) $x = 0.5555$ |
| | 14.4.2 Solve $3^x = 17$ for x to three significant digits. |
| 14.5 Solve problems using laws of logarithms. | 14.5.1 Solve for m.<br>$\log_{12} 72 - \log_{12} 9 = \log_{12} 4m$.<br>a) $m = 2$ b) $m = 8$<br>c) $m = 15\frac{3}{4}$ d) $m = 5$ |
| | 14.5.2 Solve:<br>$\log_3 (y+4) + \log_3 (y - 4) = 2$ |

# MATHEMATICS

Grade Level: 10-12 Skills/Subject Area: Algebra II

COMPETENCY GOAL 15: The learner will investigate some techniques for problem solving.

| Objectives | Measures |
|---|---|
| 15.1 Solve "word problems" (number, age, coin, perimeter, digit, work, uniform motion). | 15.1.1 Select the equation you would use to solve the following problem if n represents the number of nickels.<br>Maggie has 4 more nickels than dimes. Altogether her nickels and dimes total \$1.40. How many nickels does she have?<br>a) $5n + 10(4 - n) = 140$<br>b) $5n + 10(n - 4) = 140$<br>c) $n + (n - 4) = 140$<br>d) $10n + 5(n - 4) = 140$ |
| | 15.1.2 Two trains started toward each other at the same time from towns 732 km apart. One train traveled at 148 km/h; the other at 96 km/h. In how many hours did they meet? |
| 15.2 Use inequalities as well as equations to solve "word problems." | 15.2.1 Cory has \$10 to spend on gasoline. Gasoline costs between 64¢ and 75¢ per gallon. How many gallons of gasoline can Cory buy?<br>a) from 13 to 16 gallons<br>b) from 13 to 15 gallons<br>c) from $13\frac{1}{3}$ to $15\frac{5}{8}$ gallons<br>d) from $13\frac{1}{2}$ to $15\frac{3}{4}$ gallons |
| | 15.2.2 One number is twice another. Twice the lesser number increased by the greater number is at least 85. What is the least possible value for the lesser number? |

Skills/Subject Area: Algebra II

COMPETENCY GOAL 15: The learner will investigate some techniques for problem solving.

| Objectives | Measures |
|---|---|
| 15.3 Solve "word problems" involving fractional equations. | 15.3.1 Paul can plant his wheat crop in 10 days. His daughter can do it in 15 days. How many days will it take if they work together?<br>a) 7.5 b) 7 c) 6 d) 8<br>15.3.2 The ratio of four less than a number to 26 more than a number is one to three. What is the number? |
| 15.4 Use quadratic equations to solve verbal problems | 15.4.1 Select the quadratic equation you would use to solve the following problem.<br>Find two consecutive odd integers whose sum of their squares is 290.<br>a) $x^2 + y^2 = 290$<br>b) $x^2 + (x + 1)^2 = 290$<br>c) $x^2 + (x + 2)^2 = 290$<br>d) $x^2 + (x - 1)^2 = 290$<br>15.4.2 The length of Roanoke Park is six feet more than its width. A walkway three feet wide surrounds the outside of the park. The total area of the walkway is 288 square feet. Find the dimensions of the park. |
| *15.5 Use the Fundamental Counting Principle to solve problems. | 15.5.1 How many seven-digit phone numbers can begin with the prefix 798?<br>a) 40 b) 10,000<br>c) 1,000 d) 5,040<br>15.5.2 There are five roads from Greenville to Raleigh, six from Raleigh to Charlotte, and three from Williamston to Greenville. How many different routes are there from Williamston to Charlotte? |

**COMPETENCY GOAL 15:** The learner will investigate some techniques for problem solving.

| Objectives | Measures |
|---|---|
| *15.6 Solve problems involving permutations. | 15.6.1 How many ways can 3 students be seated in a row of 5 chairs?<br>a) 120 b) 60<br>c) 15 d) 24 |
| | 15.6.2 In how many ways can a president, a secretary, and a treasurer be chosen in a club with nine members? |
| *15.7 Solve problems involving combinations. | 15.7.1 In an algebra class of twenty students, how many different combinations of four students can be chosen to sit in the front row?<br>a) 116,280 b) 480<br>c) 4,845 d) 80 |
| | 15.7.2 From a group of six men and four women, how many comittees of two men and three women can be formed? |
| *15.8 Solve simple probability problems. | 15.8.1 Three bad eggs are put into a carton with nine good eggs. If two eggs are selected at random without replacement, find the probability both eggs are good.<br>a) $\frac{6}{11}$ b) $\frac{1}{22}$ c) $\frac{9}{22}$ d) $\frac{1}{4}$ |
| | 15.8.2 A die is to be thrown. Find the probability that the number thrown is greater than three. |

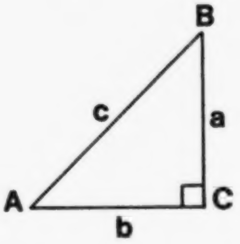
## MATHEMATICS

**Grade Level:** 10-12 Skills/Subject Area: Algebra II

**COMPETENCY GOAL 16:** The learner will use trigonometry to solve problems.

| Objectives | Measures |
|---|---|
| **16.1 Find the sine and cosine of an angle in standard position, given a point, other than the origin of the terminal side of the angle.** | 16.1.1 Determine cos A and sin A if A is the position angle of the point (-8, 15).<br>a) $\cos A = \frac{-8}{17}$, $\sin A = \frac{15}{17}$<br>b) $\cos A = \frac{8}{17}$, $\sin A = \frac{15}{17}$<br>c) $\cos A = \frac{-8}{17}$, $\sin A = \frac{-15}{17}$<br>d) $\cos A = \frac{-8}{15}$, $\sin A = \frac{7}{15}$<br>16.1.2 Determine cos A and sin A if A is the position angle of the point (-1, -4). |
| **16.2 Find the values of the six trigonometric functions of an angle, given a point other than the origin on the terminal side of the angle, or given the value of one of its functions and quadrant in which its terminal side lies.** | 16.2.1 Find the value of sec A, sin A, and cos A if $\tan A = 1$ and $\csc A > 0$.<br>a) $\sec A = \frac{\sqrt{2}}{2}$, $\sin A = \frac{-\sqrt{2}}{2}$, $\cos A = \frac{-\sqrt{2}}{2}$<br>b) $\sec A = \frac{\sqrt{2}}{2}$, $\sin A = \frac{\sqrt{2}}{2}$, $\cos A = \frac{\sqrt{2}}{2}$<br>c) $\sec A = \sqrt{2}$, $\sin A = \frac{\sqrt{2}}{2}$, $\cos A = \frac{\sqrt{2}}{2}$<br>d) $\sec A = 1$, $\sin A = \frac{-\sqrt{2}}{2}$, $\cos A = \frac{-\sqrt{2}}{2}$<br>16.2.2 If $\cos A = \frac{2}{5}$ and $\sin A = -\frac{\sqrt{21}}{5}$, find cot A and sec A. |

COMPETENCY GOAL 16: The learner will use trigonometry to solve problems.

| | Objectives | | Measures |
|---|---|---|---|
| 16.3 | Find the trigonometric function values of acute angles, in particular those of $30^\circ$, $45^\circ$, and $60^\circ$ angles. | 16.3.1 | Evaluate sec $60^\circ$ + cot $45^\circ$ - cos $30^\circ$.<br>a) $2\frac{1}{2}$ b) $\frac{6-\sqrt{3}}{2}$<br>c) $\frac{6+\sqrt{3}}{2}$ d) $\frac{3-\sqrt{3}}{2}$ |
| | | 16.3.2 | Find the trigonometric functions for angle A where m∠A = 45. |
| 16.4 | Use a scientific calculator or tables to find approximations of the values of trigonometric functions for an angle. | 16.4.1 | Find a four significant digit approximation of the given trigonometric function value.<br>tan $74^\circ 20'$<br>a) 3.340 b) 0.2994<br>c) 3.703 d) 3.566 |
| | | 16.4.2 | sin $46^\circ 20'$ |
| 16.5 | Solve a right triangle, given either the measures of a side and an acute angle or the measures of two sides and learn to solve problems involving right triangles. | 16.5.1 |  <br>State the equation that would enable you to solve for a, given m∠A = 15 and c = 37.<br>a) $\cos 15^\circ = \frac{a}{37}$ b) $\sin 15^\circ = \frac{37}{a}$<br>c) $\tan 15^\circ = \frac{37}{a}$ d) $\sin 15^\circ = \frac{a}{37}$ |
| | | 16.5.2 | Meredith is standing on top of a 200 foot cliff above a lake. The measurement of the angle of depression of a yacht on the lake is $21^\circ$. How far is the yacht from the base of the cliff? |

COMPETENCY GOAL 16: The learner will use trigonometry to solve problems.

| Objectives | Measures |
|---|---|

*These indicators would be included in an enriched course but not in a basic course.

The use of scientific calculators and computers is encouraged when the use of these resources will result in an increase in time available for high level problem solving by the reduction of computation time.

## Advanced Mathematics Outline

1. Functions

   a. Distinguish between relations and functions.
   b. Find the domain, range, and zeros of a given function.
   c. Determine and use various types of functions.
   d. Find limits and maximum/minimum points of a given function.
   e. Distinguish between continuous and discontinuous functions.

2. Polynomials

   a. Find the value of a polynomial at a given point.
   b. Use the Remainder Theorem and Factor Theorem to evaluate.
   c. Use synthetic division to evaluate.
   d. Use the Fundamental Theorem of Algebra to evaluate.

3. Trigonometry

   a. Use a table or a calculator to find values of trigonometric functions.
   b. Solve trigonometric identities.
   c. Solve trigonometric equations.
   d. Find the amplitude and period of a trigonometric function.
   e. Solve right triangles.
   f. Use the Law of Sines and Law of Cosines to solve triangles.
   g. Find inverses of given trigonometric functions.

4. Analytic Geometry

   a. Find the midpoint and slope of a line segment.
   b. Find the equation of a line.
   c. Find equations of parallel and perpendicular lines.
   d. Find equations of parabolas, circles, ellipses, and hyperbolas.

5. Mathematical Induction

   a. Prove or disprove given mathematical statements.

6. Arithmetic and Geometric Sequences and Series

   a. Find the nth term of an arithmetic or geometric series.
   b. Compute arithmetic and geometric means.
   c. Find the sums of terms of geometric and arithmetic series.
   d. Use sigma notation.
   e. Distinguish between convergent and divergent series.

7. Matrices and Determinants

   a. Add.
   b. Multiply.
   c. Find inverses.
   d. Solve a system of simultaneous equations with matrices.
   e. Use determinants and Cramer's Rule to solve systems of equations.

8. Probability and Statistics

   a. Use the Fundamental Counting Principle.
   b. Compute permutations and combinations.
   c. Use the Binomial Theorem.

9. Algebraic Equations and Inequalities

   a. Solve quadratic equations.
   b. Solve systems of simultaneous linear equations.
   c. Solve linear and quadratic inequalities.
   d. Solve exponential equations.
   e. Find all rational roots of a higher order equation.

10. Vectors

   a. Add, subtract, and multiply.
   b. Compute the magnitude and direction of a given vector.
   c. Determine and use parallel and perpendicular vectors.

11. Complex Numbers

   a. Add, subtract, multiply, and divide.
   b. Solve quadratic equations with complex roots.
   c. Convert complex numbers from rectangular to trigonometric form and vice versa.
   d. Use DeMoivre's Theorem.

12. Graphing

   a. Plot and solve linear equations and inequalities on the rectangular coordinate plane.
   b. Plot and solve quadratic equations and inequalities on the rectangular coordinate plane.
   c. Distinguish between functions and inverses using graphs.
   d. Graph trigonometric functions.
   e. Plot exponential and logarithmic functions on the rectangular coordinate plane.

13. Logarithms

    a. Use tables and a calculator to find logarithms and antilogarithms.
    b. Use logarithms to evaluate products, quotients, powers, and roots.
    c. Solve problems.

MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 1: The learner will define a function and some of its characteristics.

| Objectives | Measures |
|---|---|
| 1.1 Identify a relation. | 1.1.1 Which of the following does not describe a relation?<br>a) $y = 5x$ b) 0,1,2,3<br>c) {(1,2)(5,3)(0,-1)} d) $y \geq x-1$ |
| | 1.1.2 State the relation represented by $y = x^2$ and $-4 \leq x \leq -2$ where x is an integer. |
| 1.2 List the domain and range of a relation. | 1.2.1 What is the domain of the relation {(1,2)(1,3)(-2,8)(-1,7)}?<br>a) {Reals} b) {2,3,7,8}<br>c) {-2, -1, 1} d) {Integers} |
| | 1.2.2 State the domain and range of the relation $y = \|x\|$. |
| 1.3 Determine the domain, range and zeros of a function. | 1.3.1 Find the zero of the function $f(x) = 3x - 1$.<br>a) 0 b) 3 c) $-\frac{1}{3}$ d) $\frac{1}{3}$ |
| | 1.3.2 State the domain, range, and zero of the function $f(x) = -\frac{3}{2}x + 3$. |
| 1.4 Classify various functions. | 1.4.1 What kind of function is $y = 5x - 3$?<br>a) Linear b) Greatest Integer<br>c) Constant d) Direct Variation |
| | 1.4.2 Give an example of a constant function. |

COMPETENCY GOAL 1: The learner will define a function and some of its characteristics.

| Objectives | Measures |
|---|---|
| 1.5 Find the composition of two functions. | 1.5.1 If $f(x) = x^2$ and $g(x) = x - 1$, what does $f[g(x)]$ equal?<br>a) $x^2 + 1$ b) $x^2 - 2x + 1$<br>c) $x^2 - 1$ d) $x^2 - x + 1$ |
| | 1.5.2 Given $f(x) = x^2 + 1$ and $g(x) = x - 2$, find $f[g(x)]$. |
| 1.6 Find the inverse of a function. | 1.6.1 What is the inverse of the function $f(x) = \frac{x-3}{2}$?<br>a) $f^{-1}(x) = 2x + 3$<br>b) $f^{-1}(x) = \frac{2}{x-3}$<br>c) $f^{-1}(x) = 2x - 3$<br>d) $f^{-1}(x) = 3 - 2x$ |
| | 1.6.2 Find the inverse of the function $f(x) = 2x - 5$. |
| 1.7 Find the limit of a function when it exists. | 1.7.1 Find $\lim_{x \to -1} \frac{x}{(x^2-1)}$.<br>a) 1 b) 0<br>c) -1 d) does not exist |
| | 1.7.2 Find the limit (if possible) of $\lim_{x \to -1} \frac{(x^2-1)}{x}$. |

COMPETENCY GOAL 1: The learner will define a function and some of its characteristics.

| Objectives | Measures |
|---|---|
| 1.8 Use limits to find the slope of a tangent line to a curve. | 1.8.1 What is the slope of the tangent to $y = 3x^2 - 5x + 1$ at (2,3)?<br>a) 0 b) 5 c) 7 d) 1 |
| | 1.8.2 Find the slope of the tangent to $y = x^2 + 2x + 1$ at (-2,1). |
| 1.9 Find maximum and minimum points of a function. | 1.9.1 Where does a maximum value of $f(x) = x^3 - 3x^2$ occur?<br>a) 0 b) -1 c) 1 d) 3 |
| | 1.9.2 For $f(x) = x - x^2$ where do maximum or minimum values occur? |
| 1.10 Identify continuous functions. | 1.10.1 Which of the following are continuous functions?<br>a) $f(x) = [x]$ b) $f(x) = \|x - 1\|$<br>c) $f(x) = \frac{1}{x}$ d) $f(x) = x + 2$ |
| | 1.10.2 Why is $f(x) = x^2 + 2x$ a continuous function? |
| 1.11 Identify discontinuous functions and locate points of discontinuity. | 1.11.1 For what value(s) of x is $f(x) = \frac{x^2-1}{x+1}$ discontinuous?<br>a) 0 b) -1 c) 1 d) All of these |
| | 1.11.2 If $f(x) = x + \frac{1}{x}$ is discontinuous, state the point(s) of discontinuity. |

MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 2: The learner will perform operations with polynomials and find their zeros.

| Objectives | Measures |
|---|---|
| 2.1 Find the value of a polynomial at a given point. | 2.1.1 For the polynomial $P(x) = x^2 - 6x + 9$ what is the value of $P(3)$?<br>a) 0 b) 3 c) 18 d) 36 |
| | 2.1.2 Find the value of $P(-1)$ for $P(x) = x^4 + x^2 - 2$. |
| 2.2 Use the Remainder Theorem and the Factor Theorem to factor polynomials. | 2.2.1 Find a factor of $2x^3 - 3x^2 + x$.<br>a) $x - 1$ b) $x + 1$<br>c) $x + \frac{1}{2}$ d) $2x + 1$ |
| | 2.2.2 Show that $x - 5$ is a factor of $x^3 - 4x^2 - 7x + 10$. |
| 2.3 Use synthetic division. | 2.3.1 Use synthetic division to determine the quotient and remainder of $(x^2 + 5x - 2) \div (x + 5)$.<br>a) $x + \frac{2}{x+5}$ b) $x - 2 + \frac{2}{x+5}$<br>c) $x - \frac{2}{x+5}$ d) $x + 2 + \frac{2}{x+5}$ |
| | 2.3.2 Use synthetic division to solve $(3x^3 + x^2 - 6x + 3) \div (x + \frac{1}{3})$. |
| 2.4 Use the Fundamental Theorem of Algebra to determine the zeros of a polynomial. | 2.4.1 What are the zeros of the function, $f(x) = x^4 + 5x^3 + 9x^2 + 7x + 2$?<br>a) $\pm i, -1, -2$ b) $\pm 1, \pm 2$<br>c) $2 \pm i, -1$ d) $-1, -2, -1, -1$ |
| | 2.4.2 Find the zeros of $f(x) = x^4 - 2x^3 + 10x^2 - 18x + 9$. |

## MATHEMATICS

**Grade Level:** 11-12 **Skills/Subject Area:** Advanced Mathematics

**COMPETENCY GOAL 3:** The learner will use trigonometry to solve problems.

| Objectives | | Measures |
|---|---|---|
| 3.1 | Use a scientific calculator to find values of trigonometric functions. | 3.1.1 What is the $\sin 53^{\circ} 23'$?<br>a) 0.1289 b) 0.5965<br>c) 1.346 d) 0.8026<br>3.1.2 Find the $\cos 243^{\circ} 10'$. |
| 3.2 | Simplify trigonometric expressions. | 3.2.1 Simplify $\cos (90^{\circ} + A)$.<br>a) $\cos A$ b) $-\cos A$<br>c) $\sin A$ d) $-\sin A$<br>3.2.1 Simplify $\sin (90^{\circ} + A)$. |
| 3.3 | Prove trigonometric identities. | 3.3.1 Which identity would be used to verify $\cos A \csc A = \cot A$?<br>a) $\cos A = \frac{1}{\sec A}$<br>b) $\tan A = \frac{\sin A}{\cos A}$<br>c) $\csc A = \frac{1}{\sin A}$<br>d) $\sin A = \frac{1}{\csc A}$<br>3.3.2 Prove: $\frac{\tan A \cos A}{\sin A} = 1$ |
| 3.4 | Solve trigonometric equations. | 3.4.1 What are the principal values of x for $2\sin^2 x - 3\sin x + 1 = 0$?<br>a) $0^{\circ}, 60^{\circ}$ b) $30^{\circ}, 90^{\circ}$<br>c) $0^{\circ}, 30^{\circ}$ d) $60^{\circ}, 90^{\circ}$<br>3.4.2 Find the principal values of x for $2\sin^2 x + 3\sin x - 2 = 0$. |

COMPETENCY GOAL 3: The learner will use trigonometry to solve problems.

| Objectives | Measures |
|---|---|
| 3.5 Determine the amplitude and period of a trigonometric function. | 3.5.1 Which set of answers is the amplitude and period of $y = 3\cos(A-90^\circ)$?<br>a) 3, $270^\circ$ b) 3, $90^\circ$<br>c) 3, $180^\circ$ d) 3, $360^\circ$ |
| | 3.5.2 Determine the amplitude and period of $y = 3\cos(A-90^\circ)$. |
| 3.6 Find unknown parts of a right triangle. | 3.6.1 In right triangle ABC with C the right angle, $A = 40^\circ 11'$ and $a = 23.5$. What is c?<br>a) 30.76 b) 36.42<br>c) 27.82 d) 34.62 |
| | 3.6.2 In right triangle ABC with C the right angle, $A = 23^\circ 14'$ and $b = 126.1$. Solve for B,a,c. |
| 3.7 Find the area of a triangle given two sides and the included angle. | 3.7.1 What is the area of triangle ABC if $a = 17.7$, $b = 21.0$, and $C = 78^\circ 10'$?<br>a) 434.5 b) 443.5<br>c) 401.1 d) 181.9 |
| | 3.7.2 Find the area of triangle ABC if $a = 17.9$, $b = 21.0$, and $C = 78^\circ 10'$. |
| 3.8 Solve triangles by using the the Law of Sines and Law of Cosines. | 3.8.1 In triangle ABC, $A = 40^\circ$, $B = 60^\circ$, and $c = 20$. Find the missing sides.<br>a) 17.6, 13.1 b) 13.1, 18.4<br>c) 23.3, 13.1 d) 18.4, 17.6 |
| | 3.8.2 Solve the missing parts of triangle ABC where $c = 21.3$, $a = 14.7$, and $B = 63^\circ 36'$. |

COMPETENCY GOAL 3: The learner will use trigonometry to solve problems.

| Objectives | Measures |
|---|---|
| 3.9 Determine the inverse of a trigonometric function. | 3.9.1 What is the Arcsin $(-\frac{1}{2})$?<br>a) $60^\circ$ b) $-60^\circ$<br>c) $-30^\circ$ d) $210^\circ$<br>3.9.2 Evaluate $\sin\left(\text{Sin}^{-1}\frac{1}{2}\right)$. |

MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 4: The learner will use analytic geometry to solve problems.

| Objectives | Measures |
|---|---|
| 4.1 Find the length and the midpoint of a line segment. | 4.1.1 What is the distance between (3, -5) and (-1, 2)?<br>a) $\sqrt{5}$ b) $\sqrt{73}$<br>c) 5 d) $\sqrt{65}$<br>4.1.2 Find the length and midpoint of the segment with endpoints (3, -5) and (-1, 2). |
| 4.2 Find the slope of a nonvertical line. | 4.2.1 What is the slope of a line through (3, -5) and (-1, 2)?<br>a) $\frac{7}{4}$ b) $\frac{-4}{7}$<br>c) $\frac{4}{7}$ d) $\frac{-7}{4}$<br>4.2.2 Find the slope of the line through (1, 3) and (-2, 3). |
| 4.3 Write the equation of a line in slope intercept form or Ax + By = C form given two points or one point and the slope. | 4.3.1 What is the equation of a line that goes through (1, 5) and has a slope of -2?<br>a) $y + 2x = 7$ b) $y + 2x = 3$<br>c) $y - 2x = 3$ d) $y - 2x = 7$<br>4.3.2 Write the equation of a line through (-2, 0) and (1, -3) in slope intercept form. |
| 4.4 Find the perpendicular bisector of a given line segment. | 4.4.1 What is the equation of the perpendicular bisector of the segment with endpoints (-1, 2) and (5, 0)?<br>a) $x + 3y = 5$ b) $x - 3y = 15$<br>c) $3x - y = 15$ d) $3x - y = 5$<br>4.4.2 Write the equation of the perpendicular bisector of the segments with endpoints (4, -1) and (-2, 7). |

COMPETENCY GOAL 4: The learner will use analytic geometry to solve problems.

| Objectives | Measures |
|---|---|
| 4.5 Write the equation of a line which is parallel to a given line through a given point. | 4.5.1 What is the equation of the line through (-1, 3) that is parallel to $y = 3x + 5$?<br>a) $3x - y = 0$ b) $3x - y = -6$<br>c) $x + 3y = 18$ d) $x + 3y = 6$<br>4.5.2 Write the equation of the line through (3, -1) that is parallel to $y - 3x = 1$. |
| 4.6 Write the equation of a line which is perpendicular to a given line through a given point. | 4.6.1 What is the equation of a line through (-2,3) that is perpendicular to $x + 3y = 1$?<br>a) $3x - y = -9$ b) $x + 3y = 7$<br>c) $x + 3y = -3$ d) $3x - y = 9$<br>4.6.2 Write the equation of a line through (4, 1) that is perpendicular to $x + 3y = 0$. |
| 4.7 Use coordinate methods to prove geometric theorems. | 4.7.1 In quadrilateral ABCD the coordinates are A(0,0), B(a,0) and D(b,c). Choose the coordinates for C that would make the quadrilateral a parallelogram.<br>a) (a+b,c) b) (d,e)<br>c) (a-b,c) d) (a+b,d)<br>4.7.2 Use coordinate geometry to prove that the diagonals of a parallelogram bisect each other. |

COMPETENCY GOAL 4: The learner will use analytic geometry to solve problems.

| | Objectives | | Measures |
|---|---|---|---|
| 4.8 | Write the equation of a parabola, circle, ellipse, and hyperbola. | 4.8.1 | Which of the following is the equation of a circle where the endpoints of the diameter are (-2, -3) and (4, 5)?<br>a) $(x + 2)^2 + (y + 3)^2 = 100$<br>b) $(x - 4)^2 + (y - 5)^2 = 50$<br>c) $(x - 1)^2 + (y - 1)^2 = 25$<br>d) $(x - 1)^2 + (y - 1)^2 = 100$ |
| | | 4.8.2 | Write the equation of a parabola with vertex (6, -1) and focus (3, -1). |
| 4.9 | Solve problems regarding the characteristics of a parabola, circle, ellipse, and hyperbola. | 4.9.1 | Which of the following does not pertain to a parabola?<br>a) Vertex b) Axis of symmetry<br>c) Asymptotes d) Directrix |
| | | 4.9.2 | For the ellipse $\frac{(x-2)^2}{3} + \frac{(x + 1)^2}{8} = 1$ find the foci, length of major axis, ends of major axis, and the eccentricity. |
| 4.10 | Identify various conic sections from their second-degree equations. | 4.10.1 | $2(x - 3)^2 + 25 (x + 1)^2 = 50$ is the equation of which conic?<br>a) hyperbola b) circle<br>c) parabola d) ellipse |
| | | 4.10.2 | Place $x - 4x - y^2 = 5 + 4y$ in standard form and identify it. |
| 4.11 | Find the intersection points of lines, circles, ellipses, hyperbolas, and parabolas when given their equations. | 4.11.1 | Which of the following is the solution set of $(y - 1)^2 = x + 4$ and $y + x = -1$?<br>a) $\emptyset$ b) {(-5,4)(0,-1)}<br>c) {(-3,2)(0,-1)} d) {(0,3)(0,-3)} |
| | | 4.11.2 | Use substitution to find the solution set for $x^2 = y^2 + 9$ and $2y - x = -3$. |

# MATHEMATICS

**Grade Level:** 11-12 **Skills/Subject Area:** Advanced Mathematics

**COMPETENCY GOAL 5:** The learner will use the principle of mathematical induction to prove statements.

| Objectives | Measures |
|---|---|
| 5.1 Use induction to establish a generalization. | 5.1.1 What is the first step that is used to prove by induction that the sum of the first n positive integers is $\frac{n(n+1)}{2}$?<br>a) Assume the formula is valid for $n = k$.<br>b) Prove the formula is valid for $n = k + 1$.<br>c) Verify the formula is valid for the first possible case.<br>d) None of the above.<br>5.1.2 Prove by induction that $1.3 + 2.4 + 3.5 + . . . + n(n + 2) = \frac{n(n + 1)(2n + 7)}{6}$. |

# MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 6: The learner will solve problems involving arithmetic and geometric sequences and series.

| Objectives | Measures |
|---|---|
| 6.1 Find the nth term of an arithmetic sequence. | 6.1.1 What is the 29th term of the arithmetic sequence -7, -4, -1,...?<br>a) 74 b) 83 c) 80 d) 77<br>6.1.2 Find the 19th term of the arithmetic sequence when the first term is 11 and the difference is -2. |
| 6.2 Find the nth term of a geometric sequence. | 6.2.1 What is the 19th term of the geometric sequence 1, $\frac{1}{2}$, $\frac{1}{4}$, . . .?<br>a) $\left(\frac{1}{2}\right)^{15}$ b) $\left(\frac{1}{2}\right)^{16}$<br>c) $\left(\frac{1}{2}\right)^{17}$ d) $\left(\frac{1}{2}\right)^{18}$<br>6.2.2 Find the sixth term of the geometric sequence 10, 0.1, 0.001,... |
| 6.3 Find the arithmetic and geometric means of two numbers. | 6.3.1 Which of the following are the three geometric means between 2 and $\frac{1}{8}$?<br>a) 1, $\frac{1}{2}$, $\frac{1}{4}$ b) -1, $\frac{1}{2}$, $-\frac{1}{4}$<br>c) $\frac{49}{32}$, $\frac{17}{18}$, $\frac{19}{32}$ d) $-\frac{49}{32}$, $\frac{17}{18}$, $-\frac{19}{32}$<br>6.3.2 Find a sequence which has two geometric means between 1 and 27. |
| 6.4 Find the sum of the first n terms of an arithmetic series. | 6.4.1 What is the sum of the first 11 terms of the series -3 -1 +1 +3 +...?<br>a) 96 b) 77 c) -143 d) 79<br>6.4.2 Find the sum of the first 14 terms of the arithmetic series where the first term is 3.2 and the difference is 1.5. |

**COMPETENCY GOAL 6:** The learner will solve problems involving arithmetic and geometric sequences and series.

| Objectives | Measures |
|---|---|
| 6.5 Find the sum of the first n terms of a geometric series. | 6.5.1 What is the sum of the first six terms of the series 2 + 3 + 4.5 +...?<br>a) 3.875 b) 26.375<br>c) 3.9375 d) 41.5625<br>6.5.2 Find the sum of the first seven terms of .5 + .25 + .125 +... |
| 6.6 Find the limit of an infinite geometric sequence if the limit exists. | 6.6.1 Which of the following is the value $\lim_{n \to \infty} \frac{n+1}{n}$?<br>a) 0 b) 1<br>c) 2 d) does not exist<br>6.6.2 Find the limit if it exists of $\lim_{n \to \infty} \frac{1}{3^n}$. |
| 6.7 Find the sum of an infinite geometric series. | 6.7.1 What is the sum of the infinite geometric series $\frac{2}{3} + \frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \dots$?<br>a) $\frac{4}{3}$ b) $\frac{1}{3}$ c) 1 d) 3<br>6.7.2 Find the sum of the infinite geometric series 0.2 + 0.02 + 0.002 +... |
| 6.8 Use sigma notation to represent a series. | 6.8.1 Which of the following represents the series 2 + 4 + 8 +...+64?<br>a) $\sum_{k=6}^{1} 2^k$ b) $\sum_{k=1}^{32} 2k$<br>c) $\sum_{k=1}^{6} 2k$ d) $\sum_{k=32}^{1} 2k$<br>6.8.2 Write the series 3 + 9 + 27 +...+2187 using sigma notation. |

COMPETENCY GOAL 6: The learner will solve problems involving arithmetic and geometric sequences and series.

| Objectives | Measures |
|---|---|
| 6.9 Determine if a series converges or diverges. | 6.9.1 Which of the following series is convergent?<br>a) .5 + .25 + .125 +...<br>b) -5 -3 -1 + 1 + 3 + ...<br>c) 1 + 4 + 16 + 64 +...<br>d) All of the above |
| | 6.9.2 Is $\frac{1}{9} + \frac{1}{27} + \frac{1}{81}$ +...convergent or divergent? |

MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 7: The learner will perform operations on matrices and determinants.

| Objectives | Measures |
|---|---|
| 7.1 Add two matrices. | 7.1.1 $A = \begin{bmatrix} 4 & -7 \\ 9 & 3 \end{bmatrix}$ $B = \begin{bmatrix} -2 & 1 \\ 0 & -3 \end{bmatrix}$<br>Which of the following is A + B?<br>a) $\begin{bmatrix} -8 & -7 \\ 0 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 6 & -8 \\ 9 & 6 \end{bmatrix}$<br>c) $\begin{bmatrix} 2 & -6 \\ 9 & 0 \end{bmatrix}$ d) none of the above |
|  | 7.1.2 Find A + B if $A = \begin{bmatrix} 3 & 8 \\ -2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ -2 & 8 \end{bmatrix}$. |
| 7.2 Multiply a matrix by a scalar. | 7.2.1 Which of the following is the product of $\frac{3}{4} \begin{bmatrix} 8 & -7 \\ -4 & 0 \end{bmatrix}$?<br>a) $\begin{bmatrix} 6 & -5.25 \\ -3 & 0 \end{bmatrix}$ b) $\begin{bmatrix} -6 & 5.25 \\ 3 & 0 \end{bmatrix}$<br>c) $\begin{bmatrix} 6 & 5.25 \\ -3 & .75 \end{bmatrix}$ d) $\begin{bmatrix} 6 & 5.25 \\ -3 & -.75 \end{bmatrix}$ |
|  | 7.2.2 Find the product of $3 \begin{bmatrix} 9 & -3 \\ -6 & 6 \end{bmatrix}$. |
| 7.3 Multiply two matrices. | 7.3.1 Find AxB if $A = \begin{bmatrix} 7 & 0 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$.<br>a) $\begin{bmatrix} 14 \\ 7 \end{bmatrix}$ b) $\begin{bmatrix} 14 & 0 \\ 10 & -3 \end{bmatrix}$<br>c) $\begin{bmatrix} 14 & 0 \\ -5 & -3 \end{bmatrix}$ d) $\begin{bmatrix} 7 \\ -2 \end{bmatrix}$ |
|  | 7.3.2 If $A = \begin{bmatrix} 7 & 0 \\ 5 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & -3 & 6 \\ 5 & 4 & -2 \end{bmatrix}$ find AxC. |

**COMPETENCY GOAL 7:** The learner will perform operations on matrices and determinants.

| Objectives | Measures |
|---|---|
| 7.4 Find the inverse of a matrix. | 7.4.1 Which is the inverse under multiplication of $\begin{bmatrix} 3 & -1 \\ 4 & 2 \end{bmatrix}$?<br>a) $\begin{bmatrix} 20 & 10 \\ -40 & 30 \end{bmatrix}$ b) $\begin{bmatrix} .2 & .1 \\ -.4 & .3 \end{bmatrix}$<br>c) $\begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}$ d) does not exist. |
| | 7.4.2 Find the inverse if it exists of<br>$\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$. |
| 7.5 Use matrices to solve a simultaneous system of equations. | 7.5.1 Which is the solution of the equations $x + y + z = -2$, $2x - 3y + z = -11$, and $-x + 2y - z = 8$?<br>a) (-3, -1, 2)<br>b) (2, -1, -3)<br>c) (-1, 2, -3)<br>d) (-1, -3, 2) |
| | 7.5.2 Solve using matrices.<br>$x + y + z - 6 = 0$<br>$2x - 3y + 4z - 3 = 0$<br>$4x - 8y + 4z = 3$ |
| 7.6 Evaluate a determinant. | 7.6.1 What is the value of $\begin{vmatrix} 6 & 7 & 4 \\ -2 & -4 & 3 \\ 1 & 1 & 1 \end{vmatrix}$ ?<br>a) 13 b) 1 c) 27 d) 32 |
| | 7.6.2 Find the value of $\begin{vmatrix} 3 & 0 & 2 \\ 0 & -1 & 5 \\ 6 & 7 & 0 \end{vmatrix}$. |

COMPETENCY GOAL 7: The learner will perform operations on matrices and determinants.

| Objectives | Measures |
|---|---|
| **7.7 Use Cramer's Rule to solve a system of simultaneous equations.** | 7.7.1 Find the solution of $5x - y = 16$ and $2x + 3y = 3$.<br>a) (1, -3) b) (-1, 3)<br>c) (3, -1) d) (-3, 1)<br>7.7.2 Solve using Cramer's Rule:<br>$3x - y = 3$<br>$6x + 5y = - 1$ |

MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 8: The learner will use probability and statistics to solve problems.

| Objectives | Measures |
|---|---|
| 8.1 Use the Fundamental or Basic Counting Principle to find the number of ways independent events can occur. | 8.1.1 An automobile is available with a choice of six colors, four body styles, and either six or eight cylinders. How many choices do you have in buying this automobile?<br>a) 12 b) 48 c) 24 d) 36 |
| | 8.1.2 Sarah has 6 dresses, 5 pairs of shoes, and 2 coats. How many choices of outfits are possible with these items? |
| 8.2 Solve problems involving permutations, permutations with repetitions, and circular permutations. | 8.2.1 How many ways can 6 charms be placed on a bracelet which has no clasp?<br>a) 720 b) 60 c) 120 d) 360 |
| | 8.2.2 How many 5-letter patterns can be formed from the letters of the word "teeth"? |
| 8.3 Solve problems involving combinations. | 8.3.1 From a list of 12 books how many groups of 5 books can be selected?<br>a) 43,545,600 b) 792<br>c) 95,040 d) 346 |
| | 8.3.2 How many ways can a club of 13 members choose 4 different officers? |
| 8.4 Find the probability of an event. | 8.4.1 A box contains 3 baseballs, 7 softballs, and 11 tennis balls. What is the probability that a ball selected at random will be a tennis ball?<br>a) $\frac{3}{21}$ b) $\frac{7}{21}$ c) $\frac{11}{21}$ d) $\frac{10}{21}$ |
| | 8.4.2 Two cards are drawn at random from a standard deck of 52 cards. What is the probability that both are hearts? |

COMPETENCY GOAL 8: The learner will use probability and statistics to solve problems.

| Objectives | Measures |
|---|---|
| 8.5 Find the probabilities of independent and dependent events. | 8.5.1 A new phone is being installed. What is the probability that the final 3 digits in the telephone number will be even?<br>a) $\frac{1}{2}$ b) $\frac{1}{8}$ c) $\frac{1}{16}$ d) $\frac{1}{128}$<br>8.5.2 Find the probability of getting a sum of 7 on the first throw of two dice and a sum of 4 on the second throw. |
| 8.6 Use the Binomial expansion to solve probability experiments that fit the Binomial (or Bernoulli) Trials. | 8.6.1 Suppose that 3 dice are thrown at the same time. Find the probability that at least one 4 will show.<br>a) $\frac{1}{216}$ b) $\frac{91}{216}$ c) $\frac{1}{6}$ d) $\frac{25}{72}$<br>8.6.2 Peggy guesses all 10 questions on a true - false quiz. What is the probability that exactly half of the answers are correct? |
| 8.7 Find the mean, median, and mode of a given set of data. | 8.7.1 What is the mean of {10, 45, 58, 10}?<br>a) 27.5 b) 10 c) 30.75 d) 45<br>8.7.2 Find the mean, median, and mode of {3, 3, 6, 12, 3}. |
| 8.8 Find the mean deviation and the standard deviation of a given set of data. | 8.8.1 What is the mean deviation of the set of data {35, 40, 45}?<br>a) 40 b) $3\frac{1}{3}$ c) 0 d) $1\frac{2}{3}$<br>8.8.2 Find the standard deviation of the set of data {10, 41, 72, 83, 85}. |

COMPETENCY GOAL 8: The learner will use probability and statistics to solve problems.

| Objectives | Measures |
|---|---|
| 8.9 Organize data by using a frequency distribution. | 8.9.1 The numbers {2.5, 5, 7.5, 10, 12.5} are class marks of a frequency distribution. What is the class interval?<br>a) 12.5 b) 2.5 c) 1.25 d) 5 |
| | 8.9.2 The ages of teachers attending a summer institute are 35, 43, 55, 25, 40, 41, 39, 29, 29, 59, 44, 46, 36, and 41. Make a frequency distribution of the data using a class interval of five. |
| 8.10 Use the normal distribution curve. | 8.10.1 If there are 200 values in a set of data that has a normal distribution curve, how many values are within one standard deviation of the mean?<br>a) 68 b) 136 c) 34 d) 170 |
| | 8.10.2 If there are 1000 values in a set of data that has a normal distribution, how many values are within two standard deviations of the mean? |

MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 9: The learner will solve algebraic equations and inequalities.

| Objectives | Measures |
|---|---|
| 9.1 Solve quadratic equations. | 9.1.1 What are the roots of $3x^2 - 14x + 8 = 0$?<br>a) $4, \frac{2}{3}$ b) $\frac{3}{4}, 4$<br>c) $\frac{-3}{2}, -4$ d) $-4, \frac{-2}{3}$<br>9.1.2 Find the roots of $6x^2 + 7x + 2 = 0$. |
| 9.2 Solve two simultaneous linear equations. | 9.2.1 Where do $3x - 2y = -6$ and $x + y = 2$ intersect?<br>a) $\left(\frac{12}{5}, \frac{-2}{5}\right)$ b) $\left(\frac{2}{5}, \frac{-12}{5}\right)$<br>c) $\left(\frac{-2}{5}, \frac{12}{5}\right)$ d) $\left(\frac{-12}{5}, \frac{2}{5}\right)$<br>9.2.2 Find the point of intersection of $3x - y = 10$ and $x + 4y = 12$. |
| 9.3 Solve linear and quadratic inequalities. | 9.3.1 Solve $x^2 + 6x - 7 < 0$.<br>a) $\{x \mid -7 < x < 1\}$<br>b) $\{x \mid x < -7 \text{ and } x > 1\}$<br>c) $\{x \mid -1 < x < 7\}$<br>d) $\{x \mid x < -1 \text{ and } x > 7\}$<br>9.3.2 Solve $x - 3 > 5x - 1$. |
| 9.4 Solve exponential equations. | 9.4.1 Use a scientific calculator to solve the equation $x = \log_4 78$.<br>a) 1.2900 b) 2.4942<br>c) 3.1427 d) 0.3182<br>9.4.2 Use a scientific claculator to solve $5^{x-1} = 3^x$. |

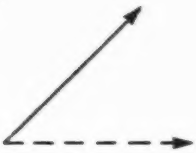
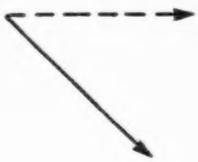
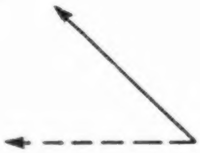
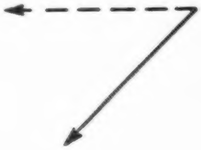
COMPETENCY GOAL 9: The learner will solve algebraic equations and inequalities.

| Objectives | Measures |
|---|---|
| 9.5 Use factoring to solve polynomial equations. | 9.5.1 Find the roots of $x^3 + 2x^2 - x - 2 = 0$.<br>a) 1, -1, -2 b) 1, -1, 2<br>c) 1, 1, 2 d) 1, 1, -2<br>9.5.2 Find the roots of $x^4 - 10x^2 + 9 = 0$. |
| 9.6 Find the rational roots of a polynomial equation. | 9.6.1 Find the rational roots of $2x^5 + 3x^4 - 6x^3 + 6x^2 - 8x + 3 = 0$.<br>a) $1, \pm 3, \frac{1}{2}, \frac{3}{2}$ b) $1, -3, \frac{1}{2}$<br>c) $-3, \frac{1}{2}, \frac{3}{2}$ d) $\pm 1, \pm 3, \frac{3}{2}$<br>9.6.2 Find the rational roots of $2x^4 - x^3 - 6x + 3 = 0$. |

## MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 10: The learner will use vectors to solve problems.

| Objectives | Measures |
|---|---|
| 10.1 Draw a vector to represent a given magnitude and direction. | 10.1.1 Use a metric ruler and a protractor to determine which of the following represents a vector with magnitude of 3cm and direction or amplitude of 40°.<br>a) <br>b) <br>c) <br>d)  |
| | 10.1.2 Draw a vector with magnitude of 5cm and direction of 120°. |
| 10.2 Represent a vector as an ordered pair of numbers. | 10.2.1 Find the ordered pair which represents the vector from A(4,9) to B(8,3).<br>a) (-4, 6) b) (4, -6)<br>c) (12, 12) d) (-4, -6) |
| | 10.2.2 Find the ordered pair which represents the vector from A(1,3) to B(-2,5). |
| 10.3 Add and subtract two vectors. | 10.3.1 If $\vec{u} = (3,-5)$ and $\vec{w} = (-4,2)$, find $\vec{u} - \vec{w}$.<br>a) (-1, -3) b) (-7, 7)<br>c) (7, -7) d) (1, 3) |
| | 10.3.2 If $\vec{u} = (1,-2)$ and $\vec{v} = (3,-5)$, find $\vec{u} - \vec{v}$. |

COMPETENCY GOAL 10: The learner will use vectors to solve problems.

| Objectives | Measures |
|---|---|
| 10.4 Multiply a vector by a scalar. | 10.4.1 If $\vec{v} = (-4,2)$, find $5\vec{v}$.<br>a) (1, 7) b) (-20, 10)<br>b) (20, -10) d) (-9, -3) |
| | 10.4.2 If $\vec{v} = (-4,-3)$, find $3\vec{v}$. |
| 10.5 Find a direction vector, a vector equation, and a pair of parametric equations. | 10.5.1 Determine a vector equation of the line through P(-2,1) with direction vector $\vec{v} = (1,4)$.<br>a) $(x,y) = (-2 + t, 1 + 4i)$<br>b) $(x,y) = (-2 + 4t, 1 + i)$<br>c) $(x,y) = (1 + 4t, -2 + i)$<br>d) $(x,y) = (1 + t, -2 + 4i)$ |
| | 10.5.2 Determine a vector equation of the line through P(0,-2) with direction vector $\vec{v} = (2,5)$. |
| 10.6 Determine if two vectors are parallel or perpendicular. | 10.6.1 If $\vec{a} = (3,5)$ and $\vec{b} = (8,-3)$, which of the following is true about the vectors?<br>a) parallel b) perpendicular<br>c) coincident d) none of the above |
| | 10.6.2 Are the vectors represented by $\vec{a} = (4,-2)$ and $\vec{b} = (3,5)$ perpendicular? |
| 10.7 Find the angle between two vectors. | 10.7.1 Find the measure of the angle between $\vec{u} = (6,0)$ and $\vec{v} = (3,4)$.<br>a) $53^{\circ}8'$ b) $73^{\circ}44'$<br>b) $36^{\circ}52'$ d) $30^{\circ}59'$ |
| | 10.7.2 Find the measure of the angle between $\vec{u} = (2,1)$ and $\vec{v} = (3,-1)$. |

## MATHEMATICS

Grade Level: 11-12 Skills/Subject Area: Advanced Mathematics

COMPETENCY GOAL 11: The learner will solve problems involving complex numbers.

| Objectives | Measures |
|---|---|
| 11.1 Add, subtract, multiply and divide complex numbers. | 11.1.1 What is the product of (3+7i) and (2-4i)?<br>a) $-22 + 2i$ b) $34 + 2i$<br>b) $34 + 2yi$ d) $-22 + 26i$<br>11.1.2 Simplify $\frac{4-3i}{2+i}$. |
| 11.2 Solve quadratic equations having complex roots. | 11.2.1 Which is the solution of $x^2 - 6x + 13 = 0$?<br>a) $-3 \pm 4i$ b) $3 \pm 4i$<br>c) $3 \pm 2i$ d) $-3 \pm 2i$<br>11.2.2 Solve $3x^2 + 5x + 4 = 0$. |
| 11.3 Represent a complex number geometrically. | 11.3.1 Which of the following is a correct geometric representation of the preceding complex number?<br>a) $5 + 4i$ (5,4)<br>b) $3i$ (3,0)<br>c) $4 - 4i$ (-4,4)<br>d) 3 (0,+3i)<br>11.3.2 Plot each of the following on graph paper.<br>a) $3 + 4i$ b) $3i$<br>c) $-6 + 0i$ d) $-5$ |

Skills/Subject Area: Advanced Mathematics Page 2

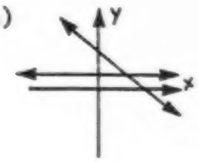
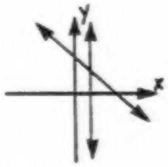
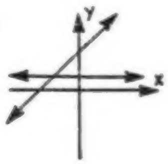
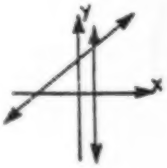
COMPETENCY GOAL 11: The learner will solve problems involving complex numbers.

| Objectives | Measures |
|---|---|
| **11.4 Convert complex numbers from rectangular form to trigonometric form.** | 11.4.1 Which of the following express $-1 + i$ in trigonometric form?<br>a) $\sqrt{2}\,(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3})$<br>b) $\sqrt{2}\,(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})$<br>c) $\sqrt{2}\,(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4})$<br>d) $\sqrt{2}\,(\cos \frac{5\pi}{3} + i \sin \frac{5\pi}{3})$<br>11.4.2 Express $3 - i\sqrt{3}$ in trigonometric form. |
| **11.5 Convert complex numbers from trigonometric form to rectangular form.** | 11.5.1 Which of the following expresses $4\,(\cos \frac{7\pi}{6} + i \sin \frac{7\pi}{6})$ in rectangular form?<br>a) $-2\sqrt{3} - 2i$ b) $2\sqrt{3} + 2i$<br>c) $2 + 2i\sqrt{3}$ d) $-2 - 2i\sqrt{3}$<br>11.5.2 Express $2\,(\cos \frac{5\pi}{4} + i \sin \frac{5\pi}{4})$ in rectangular form. |
| **11.6 Use DeMoivre's Theorem to find roots and powers of complex numbers.** | 11.6.1 Which of the following does $(1 + i)^5$ equal?<br>a) $4 - 4i$ b) $-4 + 4i$<br>c) $4 + 4i$ d) $-4 - 4i$<br>11.6.2 Use DeMoivre's Theorem to evaluate $(-2 + 2i\sqrt{3})^4$. |

MATHEMATICS

**Grade Level:** 11-12 **Skills/Subject Area:** Advanced Mathematics

**COMPETENCY GOAL 12:** The learner will draw graphs to depict algebraic, geometric, and trigonometric situations.

| Objectives | Measures |
|---|---|
| 12.1 **Use graphing to find the solution sets of pairs of linear equations.** | 12.1.1 Show by graphing, the solution set of $x = 1$ and $y + x = 3$.<br>a)  <br>b)  <br>c)  <br>d)  <br>12.1.2 Solve by graphing: $x + y = 3$<br>$2x - y = 6$ |
| 12.2 **Graph the equations of a parabola, circle, ellipse, and hyperbola.** | 12.2.1 The graph of which of the following would be an ellipse with center at (1,-2) and vertices at (1,1) and (1,-5)?<br>a) $y^2 - 8y + 3x^2 + 30x + 85 = 0$<br>b) $4y^2 + x - 8y + 6x + 9 = 0$<br>c) $9x^2 + 4y^2 - 18x + 16y - 11 = 0$<br>d) $x^2 + 8y + 3y^2 + 4x + 85 = 0$<br>12.2.2 Graph $x^2 - 12x + 3y^2 + 12y + 39 = 0$. |

COMPETENCY GOAL 12: The learner will draw graphs to depict algebraic, geometric, and trigonometric situations.

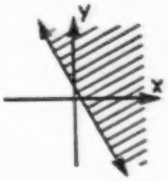
Objectives

Measures

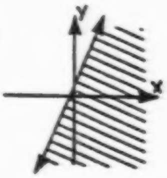
12.3 Graph linear and quadratic inequalities in one and two variables.

12.3.1 Which of the following is the graph of $y + 2x \leq 1$?

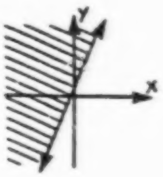
a)



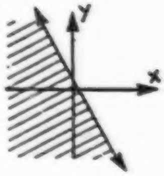
b)



c)



d)

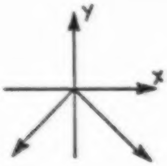


12.3.2 Graph $x^2 + 6x + y^2 + 8x \leq 0$.

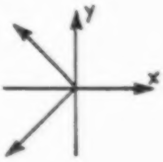
12.4 Sketch the graph of a function.

12.4.1 Which of the following is the graph of the function $y = |x|$?

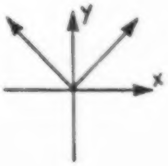
a)



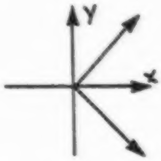
b)



c)



d)



12.4.2 Graph $y = [x + 3]$.

**COMPETENCY GOAL 12:** The learner will draw graphs to depict algebraic, geometric, and trigonometric situations.

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Objectives

Measures

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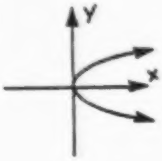
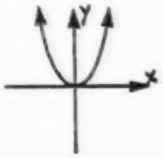
**12.5 Sketch the graph of the inverse of a function.**

12.5.1 Which is the inverse of $y = x^2$?

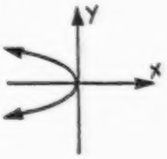
a)



b)



c)



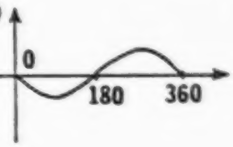
d) None of the above

12.5.2 Graph the inverse of y = 3.

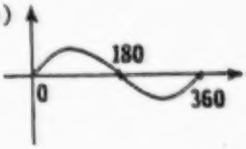
**12.6 Draw the graph of a trigonometric function.**

12.6.1 Which of the following is the graph of y = sinA where $0^\circ \leq A \leq 360^\circ$?

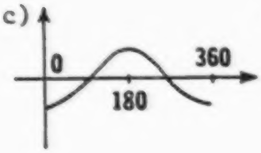
a)



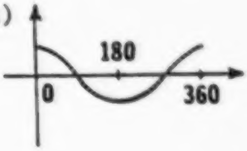
b)



c)

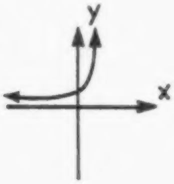
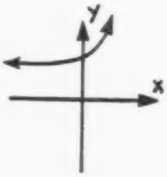
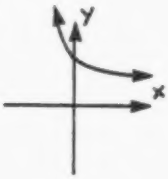
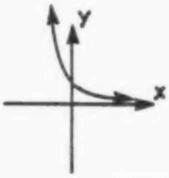
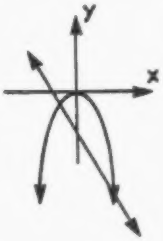
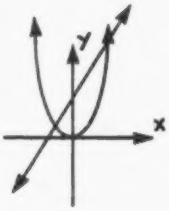
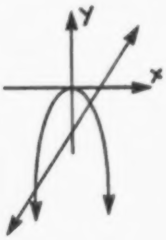
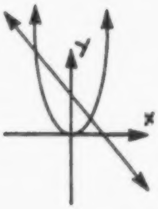


d)



12.6.2 Graph y = cos 2A where $-180^\circ \leq A \leq 180^\circ$.

**COMPETENCY GOAL 12:** The learner will draw graphs to depict algebraic, geometric, and trigonometric situations.

| Objectives | Measures |
|---|---|
| 12.7 Graph exponential and logarithmic functions. | 12.7.1 Which is most likely the graph of $y = 3^x$ ?<br>a) <br> <br>b) <br> <br>c) <br> <br>d) <br> |
|  | 12.7.2 Graph $y = 2^x$. |
| 12.8 Use graphing to find the solution sets of equations. | 12.8.1 Which graph could be used to find the solution sets of $y = x^2$ and $y - 3 = - 2x$?<br>a) <br> <br>b) <br> <br>c) <br> <br>d) <br> |
|  | 12.8.2 Solve by graphing $x^2 = y^2 + 9$ and $2y - x = -3$. |

## MATHEMATICS

**Grade Level:** 11-12 **Skills/Subject Area:** Advanced Mathematics

**COMPETENCY GOAL 13:** The learner will use logarithms to solve problems.

| Objectives | Measures |
|---|---|
| 13.1 Express an exponential function as a logarithmic function and vice versa. | 13.1.1 Which of the following are equivalent statements?<br>a) $2^3=8$<br>$\log_2 8=3$<br>b) $6^{-2} = \frac{1}{36}$<br>$\log_6 -2 = \frac{1}{36}$<br>c) $5^2=25$<br>$\log_{25} 5=2$<br>d) $3^{-3}= \frac{1}{27}$<br>$\log_{-3} \frac{1}{27} = 3$ |
| | 13.1.2 Rewrite $\log_5 \frac{1}{25} = -2$ in exponential form. |
| 13.2 Solve problems involving the properties of exponents. | 13.2.1 Which has been correctly simplified?<br>a) $-2x^{-2} = \frac{1}{2x^2}$<br>b) $5^{\frac{1}{5}} \cdot 5^{\frac{2}{5}} = 25^{\frac{3}{5}}$<br>c) $3x^0 = 1$<br>d) $81^{\frac{3}{4}} = 27$ |
| | 13.2.2 Simplify $(3^{-1}+3^{-2})^{-1}$. |
| 13.3 Use a scientific calculator to raise a number to a power or take the given root of a number. | 13.3.1 Find $\sqrt[5]{123.7}$<br>a) 4.98<br>b) 2.62<br>c) 3.33<br>d) 2.23 |
| | 13.3.2 Find $\sqrt[4]{1765.3}$ |

# APPENDICES

# APPENDIX A

## House Bill 1567*

A BILL TO BE ENTITLED AN ACT TO ENACT THE ELEMENTARY AND SECONDARY SCHOOL REFORM ACT OF 1984.

The General Assembly of North Carolina enacts:

Section 1. This act may be referred to as the "Elementary and Secondary School Reform Act of 1984."

Section 2. G.S. 115C-81(a) is amended by deleting the first paragraph and substituting the following:

"Standard Course of Study. It is the policy of the State of North Carolina to insure a quality education to every child residing in North Carolina. To this end, the General Assembly directs the State Board of Education to develop a standard course of study to be offered to every child in North Carolina public schools and to submit the proposed standard course of study to the General Assembly by October 15, 1984.

The standard course of study shall reflect a rigorous academic course of study stressing mastery of integrated knowledge based on mastery of competencies in the basic skill areas rather than the study of isolated disciplines. To this end, the State Board of Education is directed to undertake a statewide audit of current curricula and to refine the curricula as required to comply with this policy. The standard course of study:

1. shall stress mastery of integrated knowledge;

2. should provide students with the specific competencies needed to gain employment or to continue their education;

3. should provide students with the skills necessary to cope with contemporary society;

4. shall contain a vocational education component designed to meet the State's and local anticipated career training needs;

5. shall provide for a program of continuous learning based upon the individual child's need, interest, and stages of development, so that the program has a nongraded structure of organization;

6. shall set forth what subjects shall be taught in each grade, and outline the basal and supplementary books on each subject to be used in each grade;

7. shall include a core curriculum for all students plus additional elective curriculum choices to meet the varied needs and interests of students;

8. shall establish a minimum length of the instructional day;

9. shall prescribe standards for student performance and promotion and may consider appropriate levels at which remediation should begin; and

10. shall describe appropriate class size for each course required by the standard course of study; staffing levels to support the standard course of study, and may include minimum staffing for schools, regardless of size, where such schools are determined to be essential to serve pupils located in isolated geographic areas; minimum facility requirements for the standard course of study; minimum material requirements for the standard course of study; and such other information the Board finds necessary to enable the General Assembly to allocate appropriate resources to implement the plan."

*Includes only that portion of HB 1567 addressed by the Basic Education Program for North Carolina's Public Schools, the North Carolina Standard Course of Study, and the North Carolina Competency-Based Curriculum.

## APPENDIX B

16 NCAC 2E.0103; STANDARD COURSE OF STUDY: POLICIES

(a) Definitions. As used in this Rule:
- (1) "Standard Course of Study" means the program of course work for each of the various subjects taught in the elementary and secondary schools of the state, together with competency goals and performance indicators, as defined in (4) and (5) of this subsection, which have been adopted by the state board pursuant to G. S. 115C-81 (a) and subsection (b) of this Rule.
- (2) "Curriculum guide" means a document prepared by the State Department of Public Instruction for each subject or area of study listed in the Standard Course of Study, including suggestions as to suitable instructional aids, textbooks and supplementary resources, learning experiences and teaching methods.
- (3) "Course unit" means a minimum of 150 clock hours of instruction. Short courses will be credited in an amount corresponding to the fractional part of a total unit.
- (4) "Competency goals" means the ends toward which student learning is directed.
- (5) "Performance indicators" means quantitative measures of progress toward competency goals.

(b) The state board shall adopt and periodically review the Standard Course of Study, upon recommendation of the State Superintendent and pursuant to a public hearing and any changes the board deems appropriate. The Standard Course of Study shall be published by the state board. Copies of the Standard Course of Study and the curriculum guides may be obtained from the Department of Public Instruction, 116 W. Edenton Street, Raleigh, N. C. 27611.

(c) The Standard Course of Study shall include, at a minimum, a kindergarten through 12th grade program of studies in the following areas:
- (1) citizenship, including the social studies-economics, history, government, sociology and human relations;
- (2) communications, including foreign languages, educational media, and all phases and applications of English-language arts;
- (3) cultural arts, including the fine and performing arts, recreation and avocations, addressed to both performance and consumer objectives;
- (4) healthful living, including personal and community health, physical education, recreation, and safety;
- (5) mathematics, including computational, problem solving, and consumer skills and substantive advanced elective sequences;
- (6) science, including the basic study of all living and nonliving things as well as advanced elective sequences; and

(7) vocational, including a developmental design, moving from occupational exploration in the middle grades, to selective specialization in the senior high school, as set out in the state Master Plan for vocational education.

(d) The development of subject and course content in the study areas listed in (c) of this Rule shall include, as appropriate for the various grade levels, the study of Americanism, the government of the State of North Carolina, the government of the United States, fire prevention, harmful or illegal drugs including tobacco and alcohol, and the free enterprise system.

(e) The Standard Course of Study shall be implemented in the kindergarten through eighth grades through an appropriate developmental program in each study area for individual pupils. Summer school for these grades is considered an integral part of the regular school term. The Standard Course of Study shall be implemented in the 9th through 12th grades through a program of representative course offerings in each study area.

(f) Graduation Requirements

(1) In addition to the requirements of 16 NCAC 2G.0702, students graduating during or after the 1986-87 school year must successfully complete 20 courses units in grades 9 through 12 to be graduated from high school. These course units must include the following:

(A) four course units in English;
(B) two course units in mathematics;
(C) two course units in social studies; one unit in government and economics, and one unit in United States history;
(D) two course units in science, one unit in a life science or biology, and one unit in one of the physical sciences;
(E) one course unit in physical education and health;
(F) nine course units to be determined by the local education agency. These may be undesignated electives or designated from the study areas described in subsection (c) of this Rule.

(2) Course work successfully completed in the ninth grade at a school system where course units are not awarded in the ninth grade shall be deemed to satisfy the requirements of (1) of this subsection.

(3) Course work successfully completed by students in grades 9 through 12 at a summer school session may be used to satisfy the requirements of (1) of this subsection. Course units so taken shall be earned in the same manner as otherwise provided in this Rule, except that for students repeating courses in summer school the principal shall determine the hours of instruction required to be repeated.

(4) Course work successfully completed by students in grades 9 through 12 at an off-campus institution may be used to satisfy the requirements of (1) of this subsection. No high school may approve enrollment in post-secondary institutions during the regular school year in excess of five percent of its enrollment in grades 10-12 except as approved by the State Board of Education. Enrollment under this policy in community college institutions shall be in accordance with 16 NCAC 2E.0301.

History Note: Statutory Authority G. S. 115C-12(9)c; G. S. 115C-81(a);
Eff. February 1, 1976
Readopted Eff. February 3, 1978;
Amended Eff. April 1, 1983; June 8, 1979

# APPENDIX C

## COURSE REQUIREMENTS FOR HIGH SCHOOL GRADUATION

| Course Units | Subjects |
|---|---|
| 4 | English |
| 2 | Mathematics |
| 2 | Social studies (1 unit in government and economics,<br>1 unit in United States History) |
| 2 | Science (1 unit in a life science or biology,<br>1 unit in one of the physical sciences) |
| 1 | Physical education and health |
| 9 | Determined by the local education agency (these may be undesignated electives or designated in the study areas of citizenship, communications, the arts, healthful living, mathematics, science, vocational education) |
| 20 Total Course Units | |

## Recognition

1. Students meeting all requirements for a North Carolina Scholars' Program receive from the State Board of Education an appropriate seal of recognition to be affixed to the diploma.

2. Special recognition events should be held in the school and community to honor the students and their parents. These should include appropriate, special recognition at graduation exercises.

3. The State of North Carolina as well as business and industry should consider awarding other special recognitions to these students.

4. Colleges and universities should consider the North Carolina Scholars' achievement when making decisions concerning acceptance by their institutions.

5. An identification of potential candidates for this achievement should be made at the end of grade 11. Candidates would include those students who, after completing their selected senior courses with the designated grade average, would be eligible for recognition. This identification of candidates would reinforce the students' efforts to achieve the recognition and could also be included on their application forms and/or transcripts to colleges and universities.

# APPENDIX D

## NORTH CAROLINA STATE BOARD OF EDUCATION
## NORTH CAROLINA SCHOLARS' PROGRAM

### PLAN A

The North Carolina State Board of Education, believing that the success of our State and Nation depends on the full development of our youth and that some students should be encouraged to pursue a well-balanced but more vigorous high school program, institutes a North Carolina Scholars' Program.

Beginning with the 1983-84 school year, students satisfactorily completing requirements as identified by the State Board shall be named North Carolina Scholars and receive special recognition by the State Board.

### Course Requirements

| Program Area | Units |
|---|---|
| English | 4 |
| Mathematics - Algebra I, Geometry, Algebra II, one beyond Algebra II | 4 |
| Science - Biology, Chemistry, Physics (or in lieu of Physics, one other advanced science) | 3 |
| Social Studies - U. S. History, Government/Economics, World Cultures (Prior to 1987, U. S. History plus two elective units) | 3 |
| Foreign Languages - two levels of the same language | 2 |
| Health, P. E. | 1 |
| Vocational Education | 1 |
| Arts Education | 1 |
| Electives - minimum of three | 3 |
|  | 22 |

### Additional Requirement

Students must have an overall four year grade average of B or its equivalent as determined by the local board of education. Equivalency may be determined by numerical grades or weighted grade point averages.

## NORTH CAROLINA STATE BOARD OF EDUCATION
## NORTH CAROLINA SCHOLARS' PROGRAM

### PLAN B

The North Carolina State Board of Education, believing that the success of our State and Nation depends on the full development of our youth and that some students should be encouraged the pursue a well-balanced but more vigorous high school program, institutes a North Carolina Scholars' Program with concentration in one or more program areas. In order to allow more flexibility in the program, consideration should be given to the optional sequence of courses listed below as an alternative to Plan A.

Beginning with the 1983-84 school year, students satisfactorily completing requirements as identified by the State Board shall be named North Carolina Scholars and receive special recognition by the State Board.

### Course Requirements

| Program Area | Units |
|---|---|
| English | 4 |
| Mathematics - Algebra I, Geometry, Algebra II | 3 |
| Science - Biology, Chemistry, Physics (or in lieu of Physics, one other advanced science) | 3 |
| Social Studies - U. S. History, Government/Economics, one additional social studies (Prior to 1987, U. S. History plus two elective units) | 3 |
| Foreign Languages - two levels of the same language | 2 |
| Health, P. E. | 1 |
| Vocational Education | 1 |
| Arts Education | 1 |
| Electives - minimum of four (concentrations may be selected as listed below) | 4 |
|  | 22 |

## Concentrations

Mathematics - at least one additional advanced unit (balance - 3 electives)

Science - at least one additional advanced unit (balance - 3 electives)

Social Studies - at least one additional unit (balance - 3 electives)

Foreign Languages - at least two additional units of the same language (balance - 2 electives)

Health, P. E. - at least three additional units (balance - 1 elective)

Arts Education - as least three additional units (balance - 1 elective)

Vocational Education - at least three additional units (balance - 1 elective) Three of the minimum four units required for concentration in vocational education must be related to the same vocational objective. Additional units may be related to the same vocational objective or may be in other vocational areas.

## Additional Requirement

Students must have an overall four year grade average of B or its equivalent as determined by the local board of education. Equivalency may be determined by numerical grades or weighted grade point averages.

## Recognition

1. Students meeting all requirements for a North Carolina Scholars' Program will receive from the State Board of Education an appropriate seal of recognition to be affixed to the diploma.

2. Special recognition events should be held in the school and community to honor the students and their parents. These should include appropriate, special recognition at graduation exercises.

3. The State of North Carolina as well as business and industry should consider awarding other special recognitions to these students.

4. Colleges and universities should consider the North Carolina Scholars' achievement when making decisions concerning acceptance by their institutions.

5. An identification of potential candidates for this achievement should be made at the end of grade 11. Candidates would include those students who, after completing their selected senior courses with the designated grade average, would be eligible for recognition. This identification of candidates would reinforce the students' efforts to achieve the recognition and could also be included on their application forms and/or transcripts to colleges and universities.

## APPENDIX E

## NORTH CAROLINA COMPETENCY-BASED CURRICULUM

### Sample Page

Grade Level: 6 Skills/Subject Area: Social Studies/Knowledge

Competency Goal: 1. The learner will know that ways of living change over time and how and why these changes occur (history).

| | OBJECTIVES | | MEASURES |
|---|---|---|---|
| 1.1 | Identify changes which have occurred in Europe and/or the Soviet Union. | 1.1.1 | List changes which have occurred when given an appropriate series of photographs depicting changes in ways of living (dress, housing, work, transportation, and entertainment) in Europe and/or the Soviet Union. |
| | | 1.1.2 | Draw a picture depicting what s/he believes to be the most significant change to have taken place in Europe or the Soviet Union; describe the picture and explain her/his reasoning aloud to the rest of the class. |
| 1.2 | Identify the effect of important changes which have occurred in Europe or the Soviet Union. | 1.2.1 | Place the examples in chronological order when given appropriately chosen examples of change in Europe or the Soviet Union. |
| | | 1.2.2 | Match the changes to the resulting effects and identify the country in which each change/effect occurred when given a list of changes and a list of effects. |

# APPENDIX F

## TESTING REQUIREMENTS

### Annual Testing Program

The Annual Testing Program consists of standardized tests in reading, language arts, and mathematics administered at grades 1, 2, 3, 6, and 9.* Beginning with science and social studies tests, other skills and subject areas may be added to this program in the future.

### Promotion Testing

Phase 1: A student in grades 3, 6, or 8 who scores at or above the 25th percentile (total battery) in the Annual Testing Program meets the State standard for promotion and must them meet local requirements. A student who scores at the 24th percentile or below enters phase two.**

Phase 2: In phase two, a student is tested for mastery of competencies on a test developed by the State Board of Education. Students who demonstrate mastery meet State requirements and then must meet local requirements. Students who do not demonstrate mastery must be retained or attend a State-supported summer remediation program. Students attending the summer program will be assessed to determine whether they have mastered the minimum standards. Those who demonstrate mastery will have met State standards and may be promoted if they have also met local requirements. Those who have not demonstrated mastery will be retained.

### End of Course Testing

End of Course Testing is conducted at the secondary level in Algebra I and biology. It is anticipated that up to 20 other courses may be added to this program by the year 1990.

### Minimum Competency Testing

Students in grade 11*** are tested for mastery of minimum competencies in the areas of reading and mathematics. In order to graduate from high school, students must receive a passing score on all areas of the Minimum Competency Test.

* It is anticipated that testing will be moved from grade 9 to grade 8.

** The State standard will not apply to students already retained in the same grade span or certified as trainable mentally handicapped, educable mentally handicapped, or severely/profoundly mentally handicapped. Students otherwise handicapped may also be exempted according to standards and procedures developed by the State Board of Education.

*** It is anticipated that testing will be moved from grade 11 to grade 10.

## APPENDIX G

## TEXTBOOK ADOPTION PROCESS IN NORTH CAROLINA*

The first step in the adoption of basic textbooks is the appointment of a Textbook Commission as set forth in G.S. 115C-87. The law provides that the Textbook Commission shall be composed of fourteen members to be appointed by the Governor upon the recommendation of the State Superintendent of Public Instruction. The law further prescribes that seven of the members shall be outstanding teachers or principals in the elementary school grades, that five shall be outstanding teachers or principals in the high school grades, and that two shall be lay members, one of which shall be the parent of an elementary school student, and one of which shall be the parent of a high school student, with the added proviso that one of the members may be a county or city superintendent.

The State Board of Education authorizes textbook adoptions as set forth in G.S. 115C-85 and 86. The State Superintendent notifies members of the Textbook Commission that there is to be an adoption in a given subject area or areas. The State Superintendent also notifies all registered textbook publishers of the adoption call and invites them to submit any materials they would like to have considered.

Members of the Textbook Commission evaluate all textbooks offered for adoption.

All books submitted are viewed and evaluated within a frame of reference determined by the State course of study. Pursuant to a call and prior to reviewing materials, members of the Textbook Commission and the professional staff of the Department of Public Instruction engage in a thorough overview of the program of studies and develop a concise statement of philosophy, goals, and objectives for the course or subject area under consideration. This statement also reflects any changes or innovations in the program and takes into account current trends and emphases stemming from sound, authoritative research, and experimentation.

In the review and evaluation process each Commission member secures the help of as many advisers as he or she may choose. The number will vary but the usual practice has been for each member to select eight to twelve such advisers. Special expertise in the subject area under consideration is the main criterion in choosing advisers. Each Commission member tries to secure a representative group including classroom teachers, college personnel, supervisory and administrative personnel, and possibly laymen and students.

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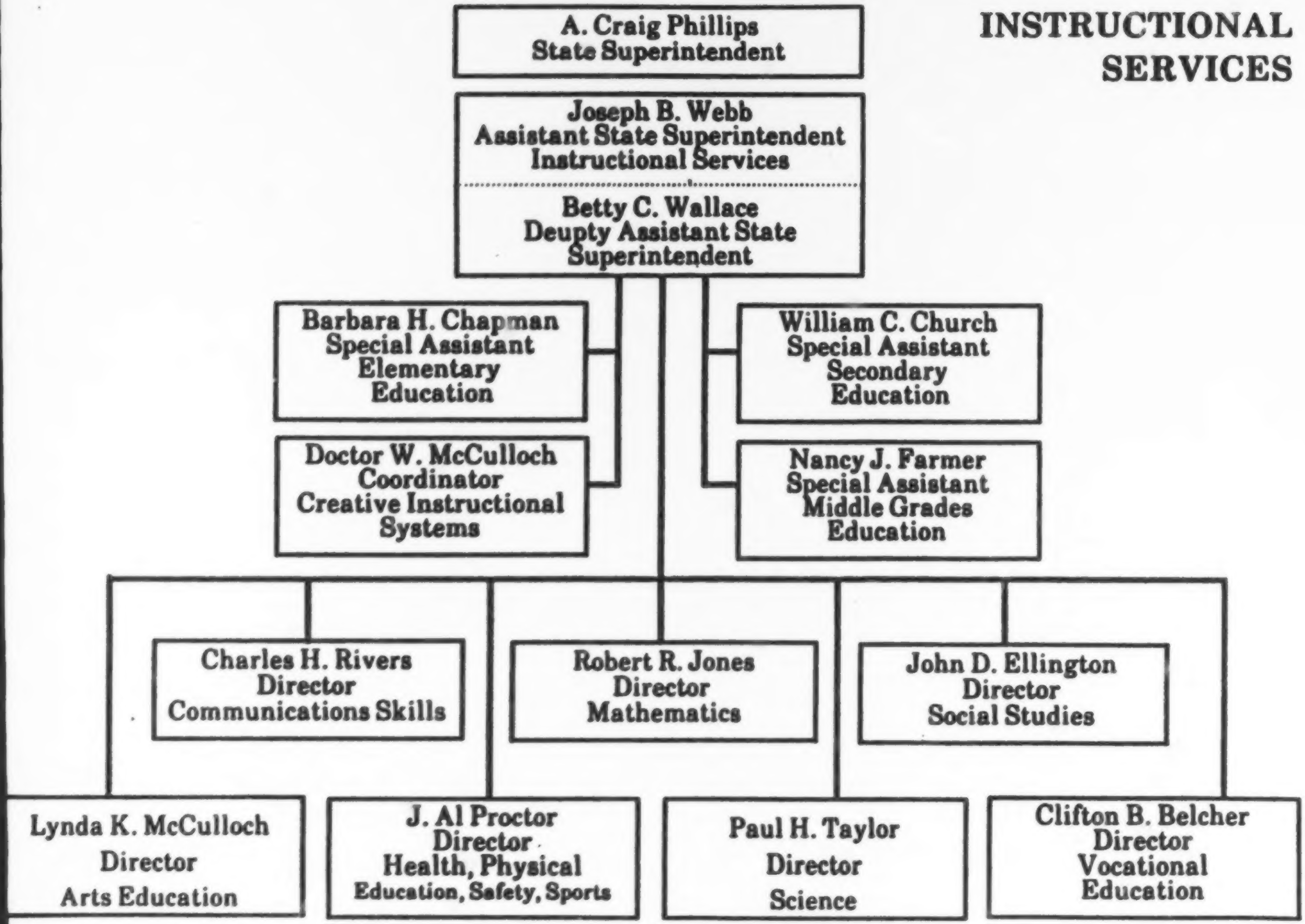
*From North Carolina State Adopted Basic Textbooks 1984-85. Raleigh, NC: Division of Textbooks, Controller's Office, Department of Public Education, 1984.

When the review process is completed, each Commission member files a written evaluation of every book submitted. These evaluation reports must be signed by the member making the report and the Commission Chairman delivers them to the State Superintendent who is also Secretary to the State Board of Education. At the next meeting of the Board of Education, after evaluation reports are filed, the members of the Textbook Commission meet with the Board for joint review and consideration of the reports. In the evaluation of basic textbooks the members of the Commission do not concern themselves in any way with the price of the book or its physical features.

Following the joint session of the Textbook Commission and the State Board to consider the findings and recommendations of the Commission, the State Board officially calls for sealed bids on those books which the Textbook Commission found to be most appropriate for implementing the desired program of instruction in North Carolina schools. Bids are customarily received on five to eight books. At the next meeting or at another designated regular meeting of the Board, the bids are opened and contracts awarded. Where significant differences in the appropriateness of books were noted by the Textbook Commission, the State Board traditionally has placed priority on securing the best materials available.

APPENDIX H

# INSTRUCTIONAL SERVICES


A. Craig Phillips
State Superintendent
Joseph B. Webb
Assistant State Superintendent
Instructional Services
Betty C. Wallace
Deupty Assistant State
Superintendent
Barbara H. Chapman
Special Assistant
Elementary
Education
William C. Church
Special Assistant
Secondary
Education
Doctor W. McCulloch
Coordinator
Creative Instructional
Systems
Nancy J. Farmer
Special Assistant
Middle Grades
Education
Charles H. Rivers
Director
Communications Skills
Robert R. Jones
Director
Mathematics
John D. Ellington
Director
Social Studies
Lynda K. McCulloch
Director
Arts Education
J. Al Proctor
Director
Health, Physical
Education, Safety, Sports
Paul H. Taylor
Director
Science
Clifton B. Belcher
Director
Vocational
Education

## APPENDIX I

### Suggestions for Additions to or Revisions of the
### North Carolina Competency-Based Curriculum

1. Suggestion for: A. addition / / B. revision / / (please check one)

2. Skills/Subject Area: ______________________________
(e.g., Mathematics, Social Studies, Science)

3. Page Number: ______

4. Addition/Revision to: (please check & give number)

Introduction / /
Competency Goal / / Number: ______
Objective / / Number: ______
Measure / / Number: ______

5. SUGGESTION: ______________________________

6. Name of person submitting suggestion: ______________________________
Place of employment: ______________________________
Employed as: ______________________________
Address: ______________________________

Please return this form to: Joseph B. Webb
Assistant State Superintendent
for Instructional Services
Education Building, Raleigh, NC 27611